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Railway Adminstrator Appointed

As we go to press, the announcement is made by President Wilson in a proclamation dated December 26 that he will assume control of all the railroads and steamship lines within the United States at noon, Friday, December 28. William G. McAdoo, secretary of the treasury, is appointed Director General of the railways to administrate in the President's behalf. The railroads will continue to be operated under their present managements, but will be utilized under the direction of the government for the transportation of "troops, war materials and equipment to the exclusion, as far as may be necessary, of all other traffic." The President's order provides also that the present officers and employees of the railways shall continue the ordinary course of their business as heretofore except as ordered to do otherwise by the director general. Supplementary to the proclamation the President has recommended acts of congress to guarantee compensation to the owners of the railways equal to the earnings of the last three years, and to provide for the maintenance of the railway properties in a condition as when taken over. In scope the order includes all the railroads of the country, all coastwise, lake and river steamship lines, all terminal railways, the Pullman Company's cars and other private car lines, all railway elevators and warehouses, all telegraph and telephone lines and all interurban roads carrying freight exclusively. As near as may be learned at present, the plan follows closely that put into effect on the English railways by the British government about three years ago. Railway officers interviewed by the press of the country have asserted their desire to cooperate fully with the President's order. Details of the Government's administration have not been announced, so it is impossible to say to what extent Mr. McAdoo will avail himself of the services of the men who have been leaders in the railways' part in the war.

A Special Labor Number

As the labor problem has been pre-eminent in 1917 so it bids fair to come even more prominently to the front in 1918. It now overshadows all others in the maintenance of way department, not even excluding that of the difficulty of securing materials. It is the primary factor on which the completion of next season's program depends. Because of the importance of this subject, the next, or February issue, of the *Railway Maintenance Engineer* will be given over to the consideration of the various phases of the labor problem. The hope for relief through immigration; the outlook for labor in various parts of the United States; the employment of women; the field for labor-saving equipment; methods of conserving labor through improved living conditions; the influence of scientific methods on the efficiency of maintenance work; defects in working conditions which have tended to bring on the present situation and their remedy, and other subjects will be presented by men who have given these problems close attention. It will be the aim of the editors to present as much valuable and practical information as possible in this issue concerning the latest developments in this phase of maintenance of way work.

THE YEAR NOW CLOSING

IN LOOKING BACK over the year which is now closing one is bewildered by the rapid passing of events. Our sudden entrance into the struggle last April has brought a train of events which have affected all industries and particularly the railways. Industrial problems at the beginning of the year were serious, but, viewed from the standpoint of present conditions, they were exceedingly simple. Things are happening with such amazing swiftness that the conditions of to-day are entirely out of date to-morrow.

The labor situation continues to hold the center of attention. The shortage of help, acute a year ago, has increased steadily throughout the year and no prospect of relief is in sight. The attitude of indifference and resignation which existed in many quarters is rapidly being replaced with a realization that the present situation is not a temporary one and that permanent relief measures must be adopted. As a result there has been a greater study of the working and living conditions of labor and of its desires than ever before. This has led to the introduction of more modern and sanitary living accommodations with some attention to the comfort of the employee. While promoted at present primarily by the urgent need of men, many of these improvements will remain, so that the standards of the camps have been raised permanently. Labor, on its part, has realized fully that it now possesses the advantage and as a result it has been more than usually transient, leaving a job on the slightest pretext, knowing that another employer will bid for its services. This has led to increased wages, tending towards demoralization of the labor market, and has been followed by a serious decline in efficiency. As a result the return in productive work per dollar of expenditure has probably been lower this year than ever before.

Conditions in the material market have been almost equally chaotic. Until within the last few months prices of nearly all supplies have been climbing upward at an alarming rate with long delays in deliveries. As a result, it has been almost impossible to proceed with any work with assurance that it would be completed on a certain date, for delay in the receipt of some relatively insignificant part may hold up the entire project. More recently the formation of the Priorities Committee and the understanding that the railways, because of the necessity of the uninterrupted operation, will be favored in securing supplies, have given promise of better conditions, although it is still too early to observe the entire effect.

The result of these adverse conditions has been the accumulation of a large amount of deferred maintenance as well as the inability to complete much improvement work authorized and under way. While the total expenditures for maintenance of way have slightly exceeded those for preceding years, the heavy increases in the unit costs of labor and materials have resulted in an actual decrease in the amount of work performed in spite of the fact that the tracks and structures have been called on to carry the heaviest traffic the roads have ever handled. While the danger point has not yet been reached, it is obvious that this neglect cannot continue indefinitely. For the first time in many years many roads had larger appropriations for maintenance this year than they could spend and they have had to return considerable amounts unexpended.

So much for the past. In considering the future, as pointed out above, the formation of the Priorities Committee will undoubtedly simplify the problem of securing materials for the roads. While supplies will undoubtedly be limited to the bare necessities for the duration of the war, the roads should now be able to secure those materials which they actually need as quickly and probably more quickly in 1918 than last year.

Conditions are not so promising with respect to labor. The demoralization and inefficiency will very probably be worse next year than last. The continued withdrawal of more men for military service will increase the demand for those remaining and draw the lower paid men into more remunerative positions. The full effect of the alien labor law will also be evident this season. The only expedient is to employ as many men as can be secured, extend the working season as much as climatic conditions will permit, adopt as many labor-saving appliances as possible to increase the unit production per man and concentrate on the most important work.

RENEWING STRINGERS

THE DISCUSSIONS appearing on another page of this issue with regard to the best procedure in renewing the stringers of wooden bridges revives a subject that was formerly a source of many controversies at gatherings of bridge and building men. While permanent construction is rapidly replacing the pile and timber trestles there are still many miles of these structures on American railways and this condition will continue for many years to come. The subject is, therefore, still a live one for the master carpenter and in the light of the current interest in labor-saving methods and devices a thorough analysis of the prevailing methods used in repairing wooden bridges and trestles will be profitable.

A study of the methods outlined in the article referred to discloses the fact that encouraging progress is being made in the application of labor-saving equipment. However, it is interesting to contrast the methods and equipment used in this work with those applied to the making of concrete for railway structures. Concrete construction is a relatively new development and, being unhampered by precedent, every man concerned with its production at the lowest possible cost has felt free to use his own ingenuity to devise methods and devices for reducing the hand labor required. Furthermore, he has not been backward in requesting the purchase of the best equipment on the market. On the other hand, wooden bridges and trestles have been built and repaired for so many years with little or no mechanical hoisting apparatus or other labor-saving equipment, that bridge and building men have hesitated to make requisitions for mechanical appliances. Consequently improvements have been largely along the lines of home made or other inexpensive devices and the actual procedure to-day departs but little from that in years past.

The problem of stringer renewal is a difficult one. The demands of traffic and other considerations usually make it desirable to leave the rails and ties in place while the stringers are being changed underneath and it is not an easy matter to use hoisting equipment standing on the track above to good advantage. Moreover, the use of a bridge derrick car occupying the track implies the presence of a train crew with its attendant expense that may more than offset the saving of labor for the gang itself. In view of these and other complications it can be said with confidence that the master carpenter has done the best with the resources at his disposal and in the absence until recently of a vital need for the greatest economy in man power.

Attention is directed to an article on another page of this issue which gives much food for thought on the study of proper methods of conducting the detailed operations of track work and it is suggested that a similar analysis in the methods of doing bridge work would be

profitable. However, it would seem that the greatest gain at the present time would come through the development and application of labor-saving equipment, since the relation between the cost of labor and the cost of power machinery varies greatly from former ratios.

THE RAILROAD SITUATION

THE MEN IN THE maintenance of way department are now confronted with so many problems that they are in danger of becoming so engrossed in them that they will fail to gain the full significance of the current events which affect the prosperity if not the very existence of the roads which are employing them. While the action of the railway presidents in forming the Railroads' War Board last spring and giving this committee of five men full authority to administer their properties was revolutionary, the full working out of this plan was shown only within the last few weeks when the roads east of Chicago and north of the Ohio river were pooled into one system for common operation. To carry this unification still further, the roads west of Chicago were instructed to send and have already forwarded over 100 locomotives to the eastern roads to enable them to handle the tremendous traffic confronting them. While this pooling is at present limited to the roads east of Chicago, the fact that it has been made effective there indicates that the Railroads' War Board will not hesitate to extend it to the western and southern roads whenever conditions require. Thus at one stroke, competition which has been encouraged for years has been wiped out.

Of even greater importance is the probability, at the time of going to press, that President Wilson will urge the appointment of a government director of the railroads when Congress convenes after the holiday recess. While it is assumed that he will urge this step only for the period of the war, it indicates a leaning towards government ownership, of which the advocates of that plan will not fail to take advantage. While the roads are not able to handle all the traffic offered to them, Fairfax Harrison, chairman of the Railroads' War Board, points out that they are handling with the present management all the business that they could handle with any management. The principal sources of aid are already within the power of the government to give—the concentration of preference orders in one bureau to prevent the present confusion and conflict of instructions which are now leading to congestion of the roads and the giving of priority in the manufacture of equipment to those cars and engines already ordered and to be ordered.

Much will depend on the character of the government director appointed. At best he could do little if any better in operating the roads than is now being done, while an inexperienced man can create untold havoc and confusion in a short time. The present is so full of possibilities and the future of the roads is so largely at stake that no railway man, even in the humblest position, can afford to lose sight of the full significance of present happenings.

LAY OF THE HOBO

Under the bridge where I used to lie,
There's a sentry stationed with eagle eye,
There's another standing with loaded gun
Where in the tunnel I used to run;
E'en in the car where I slept at night
They are carrying powder and dynamite,
With every soldier seeking a spy
The railroad's no place for a tattered guy.

LETTERS TO THE EDITOR

CONTINUE PAINTING WORK

Milwaukee, Wis.

To the Editor:

I hope the editorial in the December issue, "Don't Forget the Painting Schedule," will bear fruit. It is common practice with a great many of the railroads to discontinue painting in the fall of the year. This should not be, especially with the present labor conditions. Interior work should be done in the winter months. Conditions for varnishing, painting, etc., are ideal in a steam or hot-water heated building—no dust, no flies, no open windows and little smoke to interfere with the work. It is almost needless to say that more is gained from the point of economy with a crew of men who are in the steady employ of the roads than with a shifting force that is hired in the spring and by the time it is broken in is ready to be "fired" again.

F. C. RIEBOLDT,
Master Painter, Chicago, Milwaukee & St. Paul.

THE FOREMAN'S OPPORTUNITY

ROSSER, TEXAS.

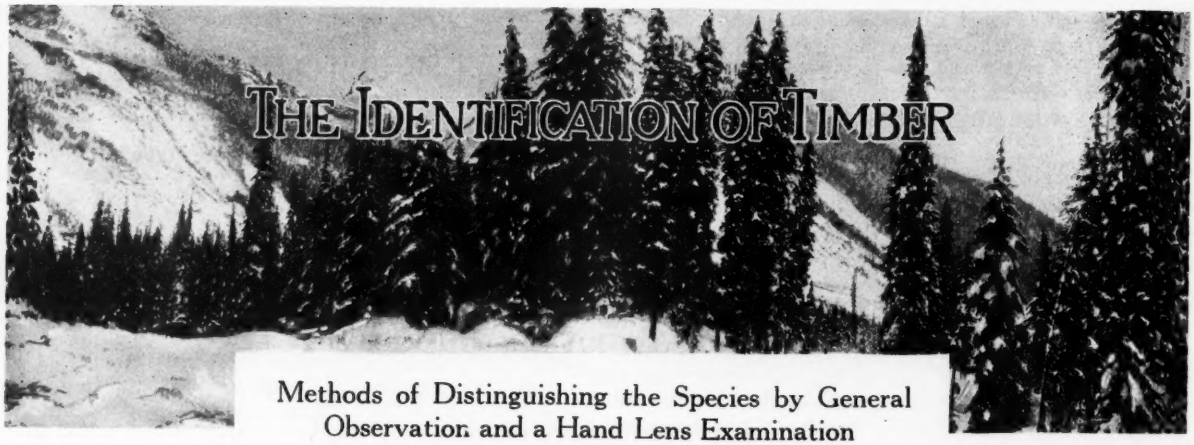
TO THE EDITOR:

A first-class trackman is fully as much a skilled mechanic as is a blacksmith, a carpenter or a mason. A thoroughly competent foreman is cheaper at fair wages than an incompetent one at small wages. It will be practical economy for railway companies to have foremen in charge of every subdivision or section of track who know how to work. When a man takes charge of a section he should feel as if it was his own, and should show his roadmaster and higher officers that he appreciates the position, by taking a pride in his work. That, in my opinion, can be done best by the proper use of the men, tools and materials assigned to him. Foremen who treat their men right and require them to do honest work are preferable to the helter-skelter, blustering, fuss-making ones who try to control their men through fear. A foreman who can make himself agreeable with his neighbors and the patrons of the road who live along the line of his section is worth a great deal more to the company employing him than one who is making enemies for himself and the railway.

Economy in practical work covers a large field. Foremen who are careful not to take out crossties that will last one year more when timbering track, and who do not allow scrap or any other material to lie scattered along the right-of-way; who do their work well and in good shape while turning out a reasonable amount of it; and who obey all orders emanating from higher authority to the best of their ability—such men may be considered masters of the art of economy, and will never be condemned for being extravagant. To maintain a safe and smooth riding track at minimum expense requires energy, judgment, and no mean order of skill.

To remedy defects and to maintain tracks properly a track man must learn the relation of the cause to the effects observed. Good enough line, or close enough gage, will not do; they must be adjusted as perfectly as one knows how. If one overlooks defects in gage, line or surface, a moving train will surely find them, and through its movements will betray them to everyone on the train.

THEODORE RADEMACHER,
Track Supervisor, Texas Midland.



THE IDENTIFICATION OF TIMBER

Methods of Distinguishing the Species by General Observation and a Hand Lens Examination

BY ARTHUR KOEHLER,
Forest Products Laboratory, Madison, Wis.

IN THE IDENTIFICATION of woods, the wood structure offers the most reliable means of distinguishing one species from another and while certain striking physical properties or peculiarities of structure may be seen with the naked eye supplemented by difference in color, odor, weight, etc., will serve to identify some woods on casual inspection. The identification of wood by its general appearance requires long experience and is a method difficult or impossible to describe to an inexperienced man. Furthermore, with the growing use of wood preservatives and the closer utilization of our forest resources the number of species used for ties is increasing and inspectors are called on to be familiar with a larger number of woods.

A detailed study of wood structure requires the use of a high-power microscope, which is impractical for field work, such as the inspection of ties. However, by observing such characteristics of woods as can be seen with the naked eye and with a hand lens a very satisfactory scheme of identification has been worked out. This scheme involves the use of two keys and distribution maps as aids in the identification.

The first key is based on such details as can be seen with the naked eye supplemented by differences in color, odor, weight, etc. In the second key such additional differences in the structure of wood have been added as can be seen with a hand lens. The use of the keys can often be simplified by eliminating all those species that an inspector is sure he will not have occasion to inspect in a given locality and the distribution maps used with the keys furnish the inspector with information as to the regions in which the different species grow. If the origin of a piece of wood is known reference to the maps will often make it clear to the inspector that it could not be a particular species which it resembles. For instance, western red cedar and arborvitæ are similar in structure and physical properties, but they grow in widely separated regions.

The keys published in the guide book contain most of the commercial species of wood and are followed by detailed description of the woods. In this article the detailed descriptions of the woods are omitted for lack of space and only such excerpts taken from the keys as is necessary to illustrate their use.

Before using the keys it is necessary to understand the common terms employed when speaking of the structure of woods. The following is a brief explanation of these terms:

ANNUAL RINGS.—Each year a tree adds just beneath the bark a layer of wood on the outside of that previously formed. The end surface of a piece of wood shows a cross-section of the annual layers of growth. These appear as concentric bands known as annual rings.

STRUCTURE OF HARDWOODS

PORES.—Pores are hollow tubes composed of comparatively large cells with open ends, set one above the other. Technically they are known as *vessels*. Pores are confined almost entirely to the hardwoods, or woods from broad-leaved trees. For this reason the hardwoods are also called *porous woods*. In the conifers the cells are all closed at the ends, and do not form vessels. For this reason the conifers are classed as *nonporous woods*.

TYLOSES.—The pores of some woods, except those in the outer sapwood, are filled with a frothlike growth called *tyloses*. These are formed by ingrowths from the neighboring cells, and fill the pores more or less like so many toy balloons crowded into an air shaft.

WOOD FIBERS.—Most of the denser, harder part of hardwoods is composed of very narrow, comparatively long, thick-walled cells known as *wood fibers*. As a rule, these fibers are too small to be distinguished separately with a hand lens, and their arrangement is rarely used for identification purposes. The conifers have no true wood fibers.

WOOD PARENCHYMA CELLS.—Wood parenchyma cells are comparatively short, usually thin-walled cells too small to be seen individually without a compound microscope. Collectively, they may be recognized on the cross section by the *light-colored* tissue they form. *Pith flecks* are abnormal groups of parenchyma cells appearing on the end surface of some woods as small discolored spots, and as darkened streaks on the longitudinal surface. They are caused by larvæ of insects burrowing in the young wood under the bark, the passages being later filled up by parenchyma cells.

MEDULLARY RAYS.—Medullary rays, also known as pith rays or *rays*, are narrow bands of cells extending radially in a tree, from the bark inward at right angles to the grain. Some of the rays in the oaks are comparatively wide and conspicuous, giving the beautiful "silver grain" to quartered oak. In some woods the rays are arranged in tiers or stories one above the other, appearing on the *tangential* surface as very fine bands running across the grain. Moistening the surface brings out

*Abstracted from a Guide Book for the Identification of Woods Used for Ties and Timbers. Issued by the U. S. Department of Agriculture, Forest Service, Washington, D. C.

these bands more clearly in some woods. This arrangement of the rays is known as *storied rays*. It is characteristic of buckeye and serves to distinguish it from other light woods, and also of persimmon, which can thereby easily be distinguished from hickory, which it resembles.

STRUCTURE OF CONIFERS

Conifers differ in structure from hardwoods in the absence of pores and true wood fibers, the radial arrangement of the fibrous cells and the presence of resin ducts or resin cells in some groups.

TRACHEIDS.—Most of the wood of the conifers is made up of *tracheids*, which are elongated cells that take the place of both the pores and the wood fibers of hardwoods. The tracheids are narrower in cross section than most pores and wider than most wood fibers of the hardwoods. With a good hand lens, a smoothly cut end surface, and good light, the tracheids can be seen in most coniferous woods. They are practically uniform in tangential diameter and are arranged in definite radial rows. In the outer part of each annual ring the tracheids become somewhat flattened radially and thicker walled, producing a harder and darker band of summerwood.

RESIN DUCTS.—The woods of the pines, spruces, larches, or tamaracks, and Douglas fir contain *resin ducts*, which are more or less continuous passages extending parallel to the grain, vertically, and, within certain medullary rays at right angles to the grain, horizontally in a tree. The vertical resin ducts may be seen with a lens, and in some of the pines usually without a lens, on a smoothly cut end surface, where they appear as darker or lighter colored specks or small pores. They should not be confused with the pores or vessels of hardwoods, which are much more numerous and serve an entirely different purpose.

WOOD PARENCHYMA OR RESIN CELLS.—Wood parenchyma in conifers is scarce. It forms a layer of one or two cells around the resin ducts, but is inconspicuous and not used in making identifications without a high-power microscope.

MEDULLARY RAYS.—The rays in conifers are very narrow, excepting those containing horizontal resin ducts, which are slightly wider. These wider rays are termed *fusiform rays* and are found only in the pines, spruces, larches, and Douglas fir. The fusiform rays occasionally help to determine the presence of resin ducts, especially in the spruces and larches, in which the vertical resin ducts are sometimes not easily found. On the radial surface the horizontal resin ducts may often be recognized as brownish lines, especially in the pines.

SAPWOOD AND HEARTWOOD.—The end surface of a log usually shows an outer lighter colored region, the sapwood, and an inner darker core, the heartwood. Certain species normally have very narrow sapwood and others very wide sapwood, and this feature often is useful in identifying woods.

BARK.—Occasionally ties have part of the bark left on them, and this is a very valuable aid in identification. Part of the inner bark is often present on ties and also helps to identify a species. It is well known that the inner bark of slippery elm becomes mucilaginous or slimy when chewed. The inner bark of sweet birch, and of yellow birch to a less extent, has a distinct wintergreen flavor, and that of black walnut and of butternut is exceedingly bitter. Some tie inspectors distinguish white oak from red oak ties by the more fibrous inner bark of the white oak. Yellow oak has a yellowish inner bark which distinguishes it from all other oaks used for ties.

PITH.—The pith is a small core in the structural center of the stem. It is usually of a darker color than the surrounding wood, but exceptions may be found. The pith is always very soft, being readily indented with the finger nail or pencil point. It varies in size from a core barely visible in cross sections to over one-fourth of an inch in diameter. It is valuable in distinguishing longleaf pine from shortleaf and loblolly pine.

PHYSICAL PROPERTIES HELPFUL

The color of wood is useful in the identification of species, but must not be relied on entirely, for it is variable in the same species, and in different species it often differs only in shade. Some woods can be identified at once by their color. The small, black heartwood of persimmon, resembling ebony, to which it is closely related, is found in no other native species. The chocolate brown color of black walnut; the lustrous red-brown of cherry; the dingy, reddish brown of red gum; the bright reddish hue of most Douglas fir; the uniform creamy yellow color of buckeye, are usually enough to distinguish these species.

Osage orange and black locust are much alike in structure, strength, durability, and color, although the former usually has more of a golden-brownish tinge. These two woods can readily be distinguished by the fact that osage orange gives off a yellowish color if wrapped in a wet rag or placed on a soaked blotter, while black locust gives off practically no color under the same conditions.

Many woods give off a characteristic odor when they are worked. Therefore, in order to determine the odor of wood, it should be whittled or, better yet, sawed and the sawdust held to the nostrils. Most of the pines have a distinct resinous odor. The cedars have an agreeable odor which reminds one of shingles; Port Orford cedar has a strong spicy odor, very noticeable when the wood is worked. Cypress has a mild rancid odor, which will always help one who is familiar with it to identify this wood no matter what the color or weight may be. Alpine fir has a rank odor when dry which distinguishes it from all other firs. Among the hardwoods, sassafras is easily recognized by its characteristic fragrance. Some oaks have a soured odor before they are dry. The odor of cottonwood is slightly disagreeable.

Taste is closely associated with odor but sometimes can be recognized more easily. Port Orford cedar has a spicy taste. Cypress and redwood have practically no taste, and through this characteristic can be distinguished from arborvitæ and western red cedar, which have a somewhat bitter taste. Sassafras wood tastes like the extract made from its roots and bark.

Wood varies considerably in weight, the variation depending on the species, the conditions under which the wood is grown, the part of the tree from which it is taken, and the amount of moisture it contains. In speaking of the weight of wood, it should be specified whether green, air-seasoned, kiln-dried, or oven-dried wood is meant, and whether the weight is based on the volume when green or after shrinkage has begun.

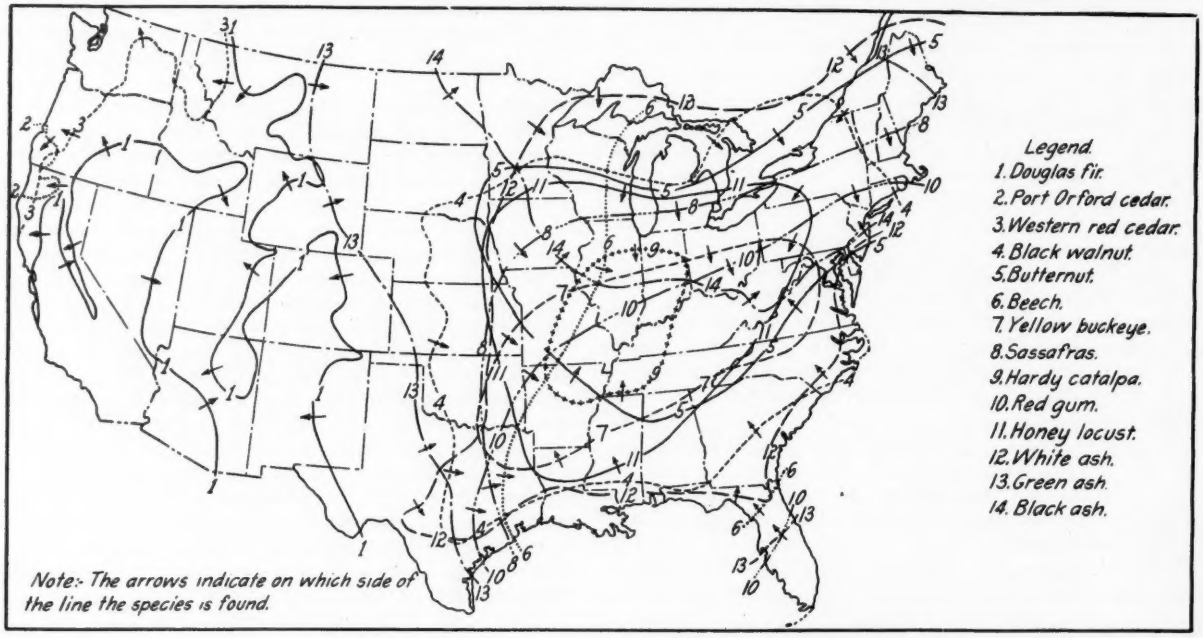
HOW TO PROCEED IN IDENTIFYING WOOD

Wood which is to be observed for its structure should be cut smoothly across the grain with a ***very sharp knife***. An inspector should provide himself, therefore, with a knife of good quality, one that will hold its edge well. Sandpapering or otherwise polishing the surface of wood will obliterate the character of the structure rather than make it more distinct.

He should also provide himself with a good hand lens, or pocket magnifier. The magnifying power of

the lens should be about 12 or 15 diameters, or from 144 to 225 times in area. To get the best results with a lens it should be placed close to the eye and then the object brought up toward the lens till it is clearly visible. Care must be taken that the object examined is well illuminated. One inexperienced in the use of a hand lens is very apt so to shade the surface of the wood with his hand, head, or hat that the structure cannot be seen distinctly. In order to steady the hands it is best to rest the hand holding the lens on the object to be examined or on the other hand holding the object.

The area which is cut smoothly for observation need not be large (about one-half inch square), but should contain annual rings of average width, preferably not near the center. In very narrow or very wide rings the characteristic structure of the wood is somewhat modified and does not serve so well for identification purposes. Slightly moistening the surface often brings out the features to better advantage.



MAP SHOWING THE GEOGRAPHIC DISTRIBUTION OF WOODS

HOW TO USE THE KEYS

The first differences brought out in the keys are based on the presence or absence of visible pores whether observed without a lens as in the first key or with a lens as in the second key. By this means woods can be grouped into two distinct classes, which could not be done so satisfactorily if the main distinctions were based on color, weight, odor, or other physical properties. Further divisions are made according to structure or physical properties, whichever shows the more easily observed and reliable differences.

If we examine the smoothly cut end surface of a piece of wood with the naked eye, and find that no pores are visible, this at once throws it into the second group of the first key, "Pores not visible." On further examining the end surface we see the medullary rays very plainly; in fact, they are "comparatively broad and conspicuous." This makes it evident that the wood belongs to group A under II, and is either sycamore or beech. We notice the rays are "not crowded" and there is a "distinct denser and darker band of summerwood present." The wood is identified as beech.

If we use a hand lens and the second key, we must class the wood under the first group, "Wood with pores," because pores can be seen with the aid of a lens. The annual rings do not contain a definite ring of large pores on the springwood; therefore, it would be classed as "Diffuse-porous." On examining the rays we find that the widest ones are fully two times as wide as the largest pores. (This distinction is more definite than that in the first key, which states that they are "comparatively broad and conspicuous.") Again we come to the alternative that it is either sycamore or beech. If we look carefully with a lens, we find that only part of the rays are broad, the others are much narrower than the pores. (This distinction also is more definite than "rays not crowded" as in the first key.) The wood is again identified as beech and the inspector has reason to feel more confident that his identification is correct because of the finer distinctions brought out with a hand lens.

Some woods are mentioned more than once in the keys. This arrangement has been found necessary whenever the characteristics of a species place it close to the line of demarcation between two groups. In such cases, because of the variability of wood structure and because of the personal interpretation that may be given to the keys, the wood may reasonably be classed under either one of the groups under which it occurs in the keys. It is therefore placed in both in order to facilitate identification.

SAMPLE KEY FOR THE IDENTIFICATION OF WOODS WITHOUT THE AID OF A HAND LENS

HARDWOODS

I. Pores visible.

A. Ring-porous; that is, the pores at the beginning of each annual ring are comparatively large, forming a distinct porous ring, and decrease in size more or less *abruptly* toward the summerwood. See Figs. 3, 4 and 5. (This feature is often more distinct in the outer sapwood where the pores are more open.)

1. Summerwood figured with wavy or branched *radial* bands. See Fig. 3.

AA. Many rays broad and conspicuous. Wood heavy to very heavy.....The OAKS', p. 36

(a) Wood without reddish tinge. The large pores mostly closed up (exception, chestnut oak). The WHITE-OAK GROUP, pp. 37

(b) Wood with reddish tinge, especially near knots. The large pores mostly open (exception, black jack oak).
The RED-OAK GROUP, pp. 39

BB. Rays not noticeable. Color grayish brown. Wood moderately light.....CHESTNUT, p. 41

2. Summerwood figured with short or long wavy *tangential* lines or bands, in some woods more pronounced toward the outer part of the annual ring. See Fig. 4.

AA. The heartwood not distinctly darker than the sapwood (the sapwood may be darker than the heartwood on account of sap stain). The wavy tangential bands conspicuous throughout the summerwood. Color yellowish or greenish-gray. Wood moderately light.....HACKBERRY, p. 43
SUGARBERRY, p. 43

BB. The heartwood distinctly darker than the sapwood.

(a) Wood with spicy odor and taste; moderately heavy. Heartwood silvery brown.
SASSAFRAS, p. 47

(b) Wood without spicy odor or taste.

(aa) Heartwood bright cherry red to reddish brown. Pores in springwood all open and very distinct. Sapwood narrow. Wood very heavy.

(a3) Pith large, usually over 0.2 and often about 0.3 inch in diameter.
COFFEETREE, p. 46

(b3) Pith small, usually under 0.15 and often less than 0.1 inch in diameter.....HONEY LOCUST, p. 45

(bb) Heartwood russet to golden brown. Pores entirely closed up except in outer sapwood. Sapwood very narrow.

(a3) Wood from very heavy to very, very heavy and exceedingly hard. Tangential bands confined to, or more pronounced in, the outer portion of the annual ring. Rays barely distinct.

(a4) Heartwood golden brown with reddish brown streaks; yellowish color imparted in a few minutes to a wet rag or blotter.
OSAGE ORANGE, p. 43

(b4) Heartwood russet brown without reddish brown streaks; color not readily imparted to a wet rag or blotter.....BLACK LOCUST, p. 44

(b3) Wood lighter, but still classed as heavy and hard. Tangential bands uniformly distributed throughout the summerwood. Rays very distinct.....RED MULBERRY, p. 44

The following are further excerpts from the keys, the first being for the identification of beech without a hand lens, and the second for its identification with a lens:

BB. Only part of the rays broad, the others narrower than the largest pores. Pores crowded in the springwood, decreasing in size and number toward the outer edge of the annual ring, thereby giving rise to a harder and darker band of summerwood. Wood usually fairly straight-grained; heavy.
BEECH

2. The rays not crowded. A distinct, denser and darker band of summerwood present. Wood usually fairly straight-grained; heavy .....BEECH

Standardizing Methods of Track Work*

BY W. C. NISBET

NEARLY ALL RAILROADS have long had standard plans showing in complete detail the proper design and arrangement of track structures. On the other hand, although labor is nearly as expensive as material and from its nature is more likely to be improperly applied and wasted than is material, it is still uncommon to find methods of work definitely described, made standard and enforced.

Logically the improvement and standardization of methods of work includes the adoption of more effective tools and appliances. Great progress has been made in all such matters in industrial work. During a preiod of three years Frederick W. Taylor and his assistants at the Bethlehem Steel Company cut up thousands of dollars worth of steel experimenting to find the best speeds and feeds in cutting metals and the best shapes of tools for all machine work. The results of this work were widely published and now shops all over the country are getting greatly increased output from the use of tools of the improved shape and other discoveries. The writer firmly believes that there are similarly undeveloped fields in track-work tools and methods which will amply repay continuous study and experiments.

LAYING RAIL

The subject of laying rail has, for some reason, been given more attention as to method than most other kinds of track work, although its labor cost is much smaller than several other items. However, there still remains much opportunity for standardization as to:

(1.) The number of men to be assigned to each operation.

(2.) Whether complete tie plating should be done at the same time the rail is laid or afterward.

(3.) Whether connections should be made by switch points or by cutting rails—if the latter, by what method?

(4.) When to do the tie spacing for the depending flanges?

(5.) How to take care of the difference in gage due to the different sizes of the head in new rail.

(6.) How to prevent idle time when connections have been made for trains due but not arrived.

(7.) How to provide for maintaining proper spacing on curves.

(8.) How much spiking and bolting should be required before letting trains over.

(9.) The extent to which perfect gage should be required when rail is first laid as compared with or setting it against the old spikes.

(10.) The best sized gang.

(11.) Laying the rail with or against the current of traffic.

(12.) Finally, the best method of laying (a) rail by rail, (b) in a string, (c) rail placed on its side by tong men, old rail thrown out in a string, new rail tilted in singly, (d-e), etc., other methods.

To indicate the wide variations in the results of laying rail by different gangs and the possibilities through the use of good methods some actual results are given below:

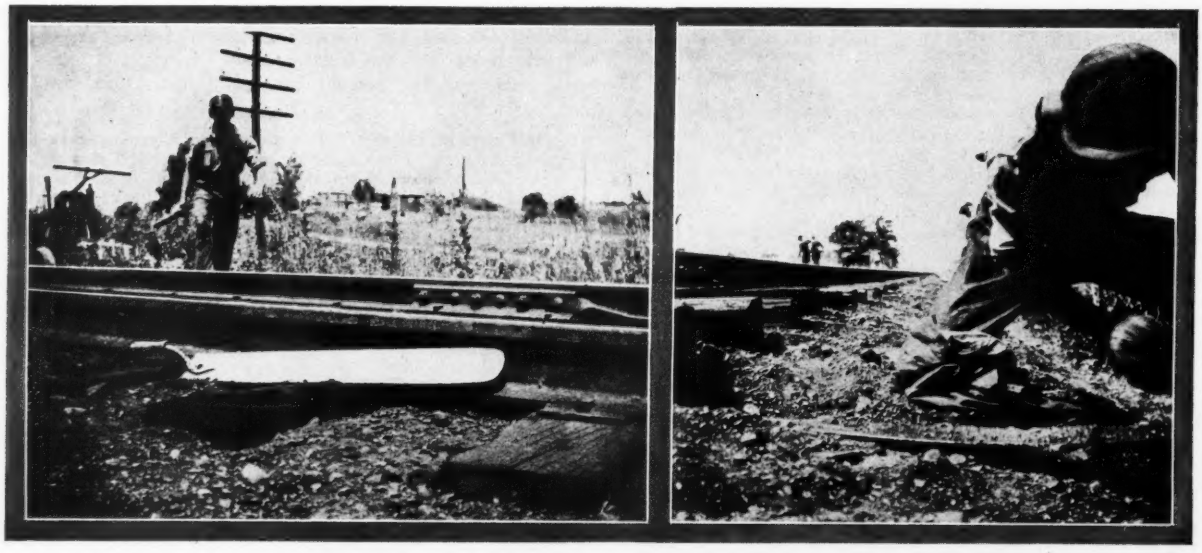
Gang	33-ft. 100-lb. rails laid	Hrs. worked	Hrs. per rail	Remarks
A	100	133	1.33	Depending flange bars.
A	100	147	1.47	Depending flange bars.

*This is the fourth of a series of articles on "The Application of the Bonus System to Maintenance Work," which have appeared monthly, starting with the October, 1916, issue.

Gang	33-ft. 100-lb. rails laid	Hrs. worked	Hrs. per rail	Remarks
A	110	175	1.59	Straight angle bars.
B	160	220	1.33	Depending flange bars.
C	78	330	4.23	Depending flange bars.
C	110	370	3.36	Depending flange bars.
D	75	490	6.53	All ties plated. Heavy traffic district.

The first six cases are comparable as to traffic conditions, etc. The poor results by gang C were due to the ill-advised methods of the foreman. Gang D was handicapped by dense traffic and was further delayed by applying tie plates to all ties.

The observations made about rail laying and to be made later about some other features of track work are intended to point out, not what is the best method, but that a great diversity of method is followed at present; that there is some one best way to do every job and that the matter should be given careful study to learn what this one best method is for each condition and make it just as standard as the construction of a frog or the arrangement of a crossover.



THE GRAVEL TAMPING TROWEL AND THE MANNER OF ITS USE

SURFACING

This operation, which requires the expenditure of the largest part of the track labor appropriation, offers a great opportunity for standardization, for nearly every foreman now has his own methods. In tamping low joints in gravel, some foremen use tamping bars, some shovels and others picks. Some tamp under one inside, leaving face of the tie and the opposite receiving face; others say it is necessary to tamp all "four corners" of each end of the tie. In some cases foremen do very little low joint tamping, considering that continuous raising is the only effective method.

Many other variations in method have been observed, some of them so remarkable that they would probably not be believed if described.

It is not unusual to see one man assigned to hold up the tie while another tamps it, and he will continue to lean on his shovel long after the tie is held up solidly by the tamping. One ingenious foreman who was looking for all the bonus possible fastened a large stone to a cord with a hook at the end and hung this to the handle of the shovel holding up the tie. It was a crude looking arrangement, but seemed to serve the purpose, and the foreman claimed he saved one man's time thereby.

There is a device sometimes used in low joint tamping in gravel which gives good results and those accustomed to its use can do considerable more in a day than with a shovel. It is a flat flexible trowel-like tool, generally made from an old cross-cut saw. The blade is about 4 in. by 20 in. with a handle like a trowel set up about 3 in. above the blade. The man operates it from the end of the tie only, digging out the ballast from the end of the tie and, with the long flexible blade, placing and ramming gravel between the tie and its hard bed clear back to the rail or beyond. Unlike the shovel, it does not disturb the compacted bed under the tie, but fills up the space between the tie in proper position and the bed referred to. The use of this tool produces better riding track than shovel tamping.

Comparative results of the two methods are given below, using average figures:

Operation	Shovel tamping in minutes	End tamping in minutes
Release jack, move forward and jack up (per end of 1 tie)	.10	.10
Dig out at end of tie	..	.32
Tap down spikes	.05	.05
Tamp under end of tie	..	.53
Tamp inside	.96	..
Tamp outside	1.10	..
Dress ballast	.46	.24
	2.67	1.24
0.1 of foreman's time for supervision	.27	.12
Time for 1 end of 1 tie	2.94 Min.	1.36 Min.

It takes some time and trouble to teach men to tamp by this method, and no doubt the advantage in speed would not always be as great as in the instance shown. However such possibilities are well worth looking into. Doubtless on every road there are isolated cases where unusual and economical methods are in effect which, if known to the authorities and put into universal practice, would result in "more work for the same money or as much work for less money."

The gangs which have been observed to make the best performance are not those which work the hardest, but

rather those which are so organized that each man can work to his capacity without being hindered by others or having to await the work of others and where no unnecessary work is done.

SURFACING WHERE TRACK IS RAISED CONTINUOUSLY

The organization of the gang for this work makes a great difference in the amount accomplished and standard methods would be of great benefit. It generally is the rule (or should be) to do the tie renewals and tie respacing at this time on account of the greater ease of doing such work, the saving of the time to open the track, tamp the new and respaced ties, and dress the ballast.

There is a wide variation in the organization and method among different foremen.

The method that takes the least labor in stone ballast is to pull the spikes on the ties to come out, jack up the track and, while still up, draw out the old ties, place the new ones and space those which need it, then proceed with the tamping. By other methods tamping has to be done twice. For example, what is perhaps the commonest way in stone ballast is to jack up what is considered a day's work, tamping with forks or shovels, and make a run off, then to return to the place of beginning and respace and renew as necessary, tamping lightly the ties worked on and finally to pick-tamp the entire stretch of track raised. It will generally be necessary to use the jack more or less at this tamping as the traffic will have pounded the track down considerably at some points. Some engineers and trackmen have a theory which the writer has seen borne out in practice on some sections, that track tamped with forks only rides better, does not pump as badly and is put up cheaper than that surfaced with picks. The theory is that the fork-tamped track is uniformly supported under each tie, while most pick tamping leaves the ties supported in a few high spots by individual stones and the ties soon begin to move in different planes under trains as a result. Also, much pick tamping pulverizes the stones so much that the dust resulting makes an ideal mixture for pumping track. Such fork-tamped track may need attention sooner than if pick tamped, but it furnishes another instance where the method of greatest ultimate economy has not yet been decided.

The facility with which gravel ballast is worked makes the method of surfacing track of that class more uniform, but there is a chance for lost time in organizing the gang improperly. For instance, if too many men are put at tamping, they will probably make no complaint and only very critical observation will show that they are not tamping as many ties per man per hour as they might readily do. The same is true of the men assigned to spacing ties. In one gang four men were observed spacing ties and the time averaged 4.4 minutes per tie. Another gang averaged 1.28 minutes per tie with the same class of labor and the same general conditions. The men in the latter gang were particularly clever at the work, however, and applied the principle of team work to perfection. Two of the four men stood outside the rails and, while holding their sledge handles in one hand, threw the gravel from in front of the tie with their shovels, manipulated by the other hand. At the same time the other two men pried the gravel from in front of that part of the tie between the rails, working their shovels with the back against the tie. This quickly removed enough ballast to allow the tie to move and the men outside the rails changed the sledges to the right hand position, stuck their shovels upright in the gravel and started to drive. At the same time the men between the rails turned their shovels over and pried with backs of the shovels against the back of the tie. As there was no lost motion and no unnecessary laying down and picking up of tools, they had reduced the time to an average of 0.32 minutes elapsed time per tie (or 1.28 min. total time). This is a good illustration of the possibilities when good methods are worked out and followed systematically. Needless to say, the gang last referred to made good bonus and was cheap help for the railroad at the price.

When unloading ballast a fixed organization is very desirable with a given number of men on the ground, and in the cars, with the duties of each definitely understood. Scoop shovels should be specified and furnished when unloading cinders or granulated slag, and No. 2

AN ECONOMICAL WAY TO SPACE TIES

shovels for stone. A long iron rod should be furnished for cinders or slag to be unloaded from hopper cars to get a hole down through the car.

ORGANIZING GANGS

In some cases a certain number of men are needed for a part of an operation, but not for the whole of it. The standard method should consider this and, if possible, utilize the spare time. It is sometimes noted that more men are assigned to a job than can be used. For example, five men are sent to truck ties and the fifth man is idle most of the time while two pairs of two men each do the work.

SALT TREATMENT OF TIMBER PILES

BY HERMANN VON SCHRENK,
Consulting Timber Engineer, St. Louis.

IT MAY NOT BE without interest at this time to describe a simple scheme for increasing considerably the life of untreated wooden piles already in position in bridges. Without question the best method for getting the most service out of piles is to creosote them thoroughly. However, there are a great many bridges with untreated oak and pine piling which, for one reason or another, were driven in an untreated condition. Such piles will decay first of all near the ground line, and if they have any appreciable amount of sap in them, this decay will usually take place with considerable rapidity. The replacement of such defective piles is a very expensive matter not only because of the labor involved, but also in view of the high first cost of the pile itself, particularly at the present time.

Some years ago the writer's attention was called by C. H. Cartlidge, late bridge engineer of the Chicago, Burlington & Quincy, to a simple scheme for increasing the length of life of piles in bridges. This scheme is

briefly as follows: A shallow box 3 to 4 in. deep is built around the head of the pile, immediately under the cap. The space between the pile and the edge of the box may vary to suit conditions, but it should be 4 or 5 in. at least. The bottom of the box should be so constructed that a small space is left between the boards and the pile itself; in other words, a snug fit should be avoided. The box can be built of any rough lumber and need not be particularly solid. After the boxes have been completed they are filled with ordinary rock salt. This can be done most easily by shoveling the rock salt from a push car on top of the bridge, because there is usually enough space between the bridge ties to make this a simple matter. Every rainstorm will dissolve some of this salt, and the more or less concentrated salt solution will run down on the outside of the piles and will a very few years, but a recent inspection of the piles treated with these salt boxes showed that they are in absolutely perfect condition. The writer is indebted to Mr. Hanley for a number of photographs taken during the past month, which show the present condition of these piles better than could be done by any form of description.

The expense of this type of treatment is exceedingly small. It will depend a good deal upon the locality in which the bridges are built, because in regions of high annual rainfall it will be necessary to fill the salt boxes a greater number of times than in regions where there is less rainfall. This treatment may be applied either to comparatively new piles, if it should be found impossible to creosote them, or to piles which have been in bridges for varying number of years. Even piles which have

THREE VIEWS OF PILING IN THE SAME BRIDGE, DRIVEN IN 1912. TWO VIEWS AT LEFT SHOW PILES PROTECTED WITH SALT BOXES IN 1913 AND STILL SOUND. STICK AT RIGHT UNPROTECTED AND SAPWOOD BADLY DECAYED

be absorbed to a considerable degree by the outer layers of the wood.

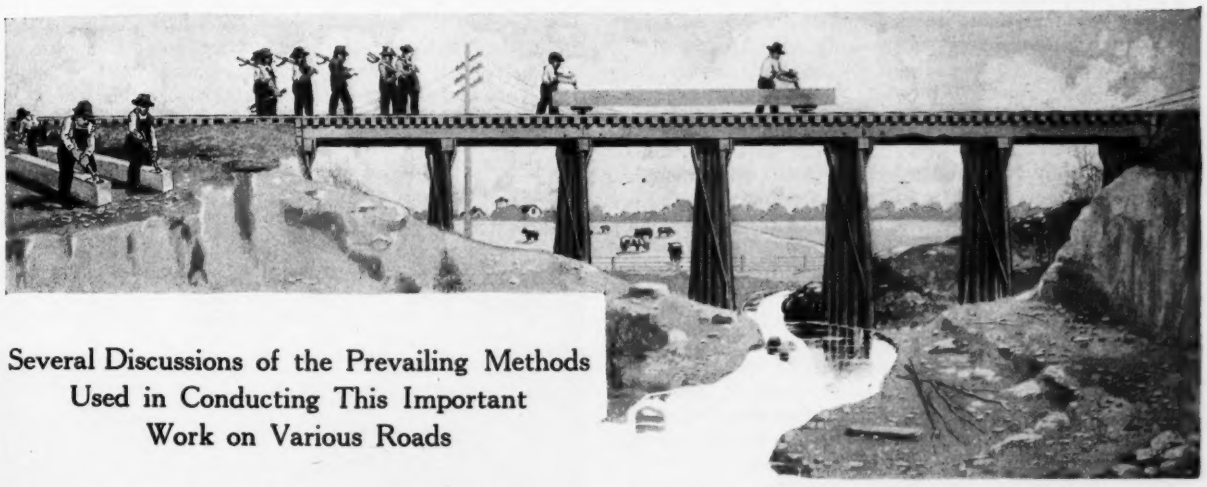
It has been known for a great many years that common salt is an antiseptic and prevents decay. Although it is a comparatively weak antiseptic, and, because of its solubility in water, it cannot usually be employed for timber preservation. The scheme above outlined does away with the objection of solubility, because every time that any of the salt is leached out by the water a new supply is added immediately and automatically by the solution flowing from the box.

In 1913 a number of these salt boxes were installed, at the writer's suggestion, by W. S. Hanley, then chief engineer and now superintendent of the New Orleans Great Northern. The bridges in which these boxes were placed were built of yellow pine piling in 1912, and the salt boxes were fitted in 1913. These boxes have therefore been in position four years. It is well known that pine piles having a high percentage of sap will decay in started to decay slightly at the ground line will be benefited by this treatment, because the salt treatment will materially reduce, if not entirely stop, the decay already started.

The simplicity and cheapness of this scheme should appeal to those who are interested in the maintenance of bridges, particularly during the present period where everyone is endeavoring to get the maximum possible service out of material already in position. Every stick of piling saved now means that much less material required for repair work and just that much more labor saved.

It should, of course, be understood that this procedure is applicable only to bridges already built of untreated piling. The writer does not believe one would be warranted in the use of untreated piles in a new bridge with the idea of protecting them by means of these salt boxes, unless for one reason or another it would be impossible to creosote the piles.

RENEWING THE STRINGERS ON TRESTLES



Several Discussions of the Prevailing Methods Used in Conducting This Important Work on Various Roads

THE methods followed in renewing stringers on pile or frame trestles under traffic have been discussed for many years by bridge and building men, but with the increased loads stringers have increased in size or a greater number of them are used to the chord, all of which has some bearing on the way in which the renewals are made at the present time. The greatly intensified labor shortage now current has introduced another factor. All of these considerations have been taken into account by the four railway bridge men who discuss various methods of making stringer renewals on this and following pages.

TRAFFIC CONDITIONS DETERMINE METHOD

By E. M. Grime,
Supervisor of Bridges and Buildings, Northern Pacific, Dilworth, Minn.

Conditions resulting from our entry into the world war make it the patriotic duty of every railway maintenance officer to see that repair or renewal work of all kinds is carried on so as to cause the minimum delay to traffic. This condition in turn calls for full crews of experienced men, especially in the bridge department. Unfortunately, the labor situation at this time is the most serious that has ever confronted us and the deficiency in men must be made up in some measure, if possible, by labor-saving methods or mechanical devices.

The renewal of the stringers of a bridge under traffic is about as difficult as any work required of the ordinary bridge crew. Years ago when light power was in use and bridge stringers consisted of 6-in. by 16-in. or 7-in. by 14-in. timbers, not over one 14- or 16-ft. span in length, the changing out of a stringer was a comparatively simple matter. Now many modern pile or trestle bridges have stringers of 9-in. by 18-in. or even 10-in. by 20-in. timbers usually 28 to 30 ft. long so as to reach over two spans. These stringers are generally built up into two chords, each chord located directly under the track rail and consisting of three or four lines of stringers, alternate stringers breaking joints at panel points, and all bolted together so as to form practically a continuous girder. This plan makes the work of renewing stringers difficult for a small crew especially, on account of the size and weight of the timber and the necessity of opening up two spans of the bridge at a time.

In the early type the stringers were usually drifted to the cap, making removal tedious, and the cap was often seriously damaged by the drift bolts. In this respect the modern type of bolted stringer chord held to proper bearing on the bents either by means of a bolt extending through one stringer and each cap, or by an angle iron on the side of the stringer bolted to the stringer and the cap, or by an iron strap fastened to the stringer by lag screws and bolted to the side of the cap is a much better design. The removal of a few bolts leaves the stringers ready for the changes that are to be made.

Pile Driver May Be Used

When it becomes necessary to renew one of these built-up stringer chords the usual method is to lay out the new chords on a level stretch of ground adjacent to the bridge site, frame the stringers for each bearing point and bore all bolt holes so the chords are ready to be set into position in the bridge. If the division is one where there is constantly use for a pile driver and a work train, and a good-sized crew is available, the removal of the old chords and placing of the new is done with little delay to traffic by making use of the pile driver with a derrick boom rigged up at the front end so that two panels of the chord previously bolted together can be set into place at a time. At best this method is expensive, and as the equipment is not usually available and crews have shrunk in many cases from ten or twelve men to half that number, other methods must be used.

A second method of placing new stringers is somewhat slow and tedious, but commends itself because the work can be carried on with absolutely no delay to traffic other than what may be caused by a five- or ten-mile slow order over the bridge. In this case the new stringer chords are laid out as before. The old stringer chords in the bridge are loosened up, the bridge deck raised about one inch on jacks and one of the old chords shifted toward the center. One of the new chords is then laid out on the end of the caps and it, too, crowded over toward the center of the bridge until space is left on the end of the caps to permit placing the other new chord. Then with all four chords on the caps the chords are gradually crowded over, one stringer at a time, until finally the two old chords are crowded out at the oppo-

site side and removed from the bridge, and the two new chords left in correct position, bolted together, the deck dropped back to position and the bridge completed. This method does not endanger traffic over the bridge at reduced speed; in many cases flagmen are not necessary and it can be done very successfully with a crew of six men.

AN ECONOMICAL METHOD

A third method is more economical than either of the above, but may cause some slight delay to traffic, unless the foreman is fully informed as to the movement of trains. The new chords having been made ready as before, the bridge is prepared by removing all the bolts from one of the old chords and cutting the center line of stringers of this chord at the odd-numbered bents so the entire chord on one side may be removed two span lengths at a time. Jacks are placed on the caps at the inside edge of the chord and the deck raised one inch on this side so the old stringers can be slid out to the side two panel lengths at a time, removed, and new chord members set in their place. The diagram shows the various steps in placing the stringers by this method in one chord of an eight-span bridge.

Fig. 1 shows four jacks in place to raise deck to permit stringers to be slid out to side, center tier of stringers cut at bents 3, 5 and 7. All bolts removed in one chord, but ties and guard timber intact.

Fig. 2 shows stringers A and C (32 ft.) and B (16 ft.) in place. Jacks moved forward one span.

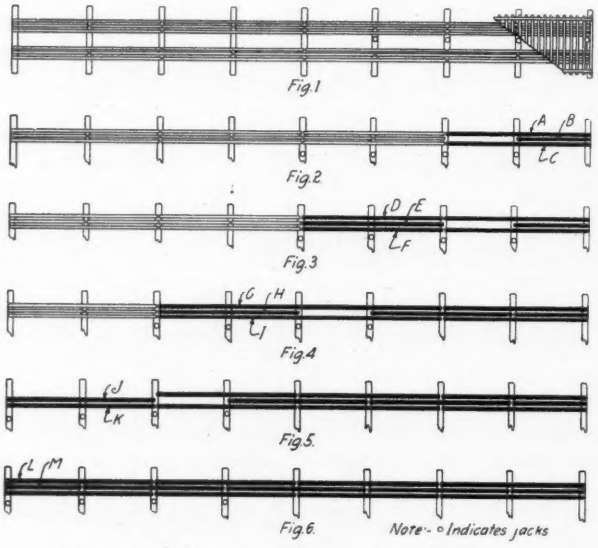
Fig. 3 shows the old stringers removed in spans 3 and 4 and stringers D, E and F placed.

Fig. 4 shows stringer E shifted forward, old stringers removed and stringers G, H and I placed. Jacks forward two spans.

Fig. 5 shows stringer H shifted forward, old stringers removed and stringers J and K placed. Jacks forward two spans.

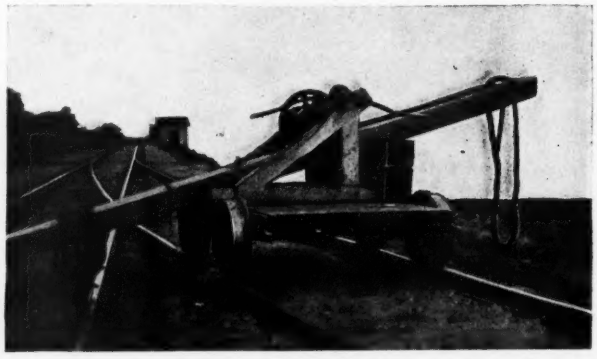
Fig. 6 shows stringer J shifted forward, stringers L (32 ft.) and M (16 ft.) set and new chord complete.

This work can be well handled by a crew of foreman and six men, two men flagging and four in the working



SUCCESSIVE STEPS IN RENEWING STRINGERS

crew, and it may be greatly facilitated and delays avoided if the crew is provided with a portable telephone so the foreman can get a line-up on trains and thus arrange his work so as not to have a section of chord out when a train is due. Following this method, a crew consisting of foreman and six men changed out one chord of a nine-span pile bridge in a working day of ten hours. This included bolting the stringers together, placing packing washers between stringers and fastening the chord at bearings, making all ready for regular traffic. The cost in this case figured $3.54 per 1,000 ft. b. m. This particular work was done on a branch line where there was but little train interference, but trains were to be expected at any time, and the work would probably have cost not to exceed $5 per 1,000 ft. b. m. if done in the same manner on the main line.



A HOME MADE HOIST

In the two hand methods outlined above time and money is saved by the use of a crab mounted on a push car, as shown in the photograph. This crab is a home-made affair, consisting of a frame made of four-inch timber bolted to the deck of the car and on which the gearing from a discarded hand car is mounted, with a ten-inch oak drum placed on the large gear axle. Through this frame is run a 6-in. by 10-in. timber blocked up on one side of the car, as shown, and bolted through the deck of the car at the other side. The lifting rope operates between two six-inch sheaves fastened in a slot near the upper end of this timber. When in use a rail clamp with a chain fastened around the lower end of the beam overcomes any tendency to overturn the car.

Two men at the crab and one man tending the rope on the drum easily pick up a 9-in. by 18-in. stringer from the side of the embankment at the end of the bridge. When swinging clear it is ready to be run out on the bridge and let down onto the end of the caps in position to be shifted home. Portable derricks on push cars have been in use for some years for bridge work, but the outfit described is recommended for simplicity, is quite stable, is easily handled on and off the track by four men, and there is far less chance for an accident when it is used than when the timber is handled by "brute force and awkwardness."

Local conditions, such as density of traffic, help or equipment available, condition of the bridge, importance of completing during favorable weather, etc., usually determine the best method to follow for placing stringers in any given case, but the last-mentioned plan is favored as being most rapid and economical.

SOUTHERN PACIFIC METHODS

BY G. W. REAR,
General Bridge Inspector, Southern Pacific, San Francisco, Cal.

The Pacific System of the Southern Pacific Lines has a little over 80 miles of open-deck trestles and the average annual renewal of stringers and ties amounts to approximately five miles, with extensive deck repairs on about three miles additional. In handling this amount

of work, many schemes have been developed and several methods are in use, but where complete renewals of stringers are made the general practice is to use one of the methods described below.

Where the trestles are of some length, not over about 20 ft. high, train service rather frequent, and a good-sized gang is available, the procedure is as follows: Having measured the distance from center to center of the bents and ascertained the size of the stringers at each cap, the new stringers are framed and marked for location. The old chord or separator bolts are then removed and the new stringers are taken out on the trestle by the best available method and are placed flatwise on the outer ends of the caps, one on top of another, with the outside stringer on the bottom and with the lower side of the stringer toward the center of the track.

When properly placed the stringers are bored for the separator bolts and are then ready for placing. The guard timber and bolts are then removed from the old deck or from as much of it as can be replaced in the available time, trains running on a slow order in the meantime.

When sufficient time can be had between trains (after protecting the track) the rails and ties are jacked up sufficiently and blocked on the caps under the ties, the old outer stringer is rolled down on its flat, the old

LIGHT DERRICK USED ON SOUTHERN PACIFIC

inner ones rolled over it and over the new stringers and allowed to fall to the ground. The two new inner stringers are then rolled into place, the old outer one rolled out and the new outer one placed. Track is lowered and ready for traffic. Separators and bolts are then placed as may be convenient. This system is varied according to circumstances, sometimes by inserting about half of the new ties before changing the deck, or by changing the ties at the same time as the stringers, depending on the available time and number of men.

THE METHOD IS RAPID

The advantages of this method are that a larger number of men can work at the actual changing of the stringers and more work accomplished while the track is obstructed. It is surprising the amount of deck that can be renewed by this method. As much as 300 ft. have been changed in one hour by 20 men.

The second method is used where conditions warrant, say, where trestles are high, plenty of time between trains, gangs smaller, etc. Having measured the sizes and lengths of the stringers required, the timber is framed on skidways at the end of the trestle, with the stringers on each side of the track in a position corresponding to that they will occupy in the trestle. The bolt holes for the separator bolts are then bored and the stringers are ready to be placed.

One side of the track is jacked up an inch or two and blocked under the ties on the cap, just inside of the stringers. Then with a small derrick on a push car the stringers are taken out, in turn, taken ashore and the corresponding new one brought in and placed. This method is, of course, varied by taking out and bringing in more than one at a time, according to the capacity of the push car or available derrick, or according to the notion of the foreman in charge. Usually five stringers are handled at one time. This is supplemented sometimes by placing two box rollers on the push car that carries the derrick and one on another car behind it. Then as the stringers are removed they are transferred to the second car, permitting the derrick car to stay on the trestle.

By this method the old stringers are not thrown to the ground, but it takes more time to change the stringers. Of course, traffic can be restored in a few minutes, but this is true of either method. While no figures have been kept showing the best record for changing stringers in this manner, one record of 150 ft. of deck changed in 75 min. is reported.

REPAIR WORK

In repairing stringers two methods have been followed. Where all the stringers are in about the same condition and are good for two or three years, except for decreased strength, it is usual to add another stringer of second-hand material, of about the same age as the others, if possible. This is usually done by bunching the stringers closer together and placing the new one on the outside and is done without disturbing traffic.

Experience has shown the desirability of using second-hand material to reinforce old stringers, as a new one, being stiffer, is very liable to break. To obtain second-hand stringers it is customary to renew the stringers entirely on some of the trestles of about the same age and use the old stringers to reinforce others.

The second method is used where nearly all of the stringers are good, but a few scattering ones are broken or decayed. It is the usual practice to remove the old stringer and replace it with another of suitable quality.

If the one to be replaced is on the outside, the replacement is easy, it being only necessary to take the old one out and put in the new one, but if it is one of the inner leaves, it is necessary to remove some of the ties to get at it. The regular practice in removing one of the inner stringers is to pull the spikes in the ties for one panel and launch them endwise enough to clear the stringer to be removed; then, by raising the track a little, the stringer may be raised at one end and pulled endwise

enough to let the other end drop off the cap, when it can be removed. The new one is placed in the reverse manner.

The present standard heavy-traffic trestle of the Southern Pacific has four 8-in. by 17-in. stringers under each rail, the panels being 15 ft. The stringers are 30 ft. long and two break joints on each cap. It would not appear to make much difference whether they break joints in pairs or alternately, but the practice is to break them alternately, although this will probably make them a little harder to replace. The stringers are bolted up into a continuous chord, using 5 bolts per panel, with cast-iron separators. Each chord is fastened to each cap with one ¾-in. bolt, which goes through the cap, stringer, tie, and, where possible, the guard timber. It is our experience that this fastening is sufficient to hold the deck in line, there being less tendency for the deck to shift on the caps than for the bents to go out of line and pull the deck with them.

PLAN FOR DENSE TRAFFIC LINE

By B. F. Pickering,
Supervisor of Bridges and Buildings, Boston & Maine, Salem, Mass.

Where traffic is congested it is impossible to secure any time when rails may be removed. Consequently the pile or frame bent is first repaired or rebuilt, as the case may be, with new caps installed under old stringers. Then after careful measurement is made the stringers are cut to exact length and sized to secure the proper elevation. Each piece is marked for the position it is to occupy and placed as near that location as conditions will permit. All lining spikes are removed from the ties on one side of the bridge and if any blunt bolts remain which hold the stringers to the caps these are removed from this side. In some cases where the cap has not been disturbed it is necessary to drive a wedge under the stringers on top of caps and saw off the blunt bolts, which may be done with an ordinary hand saw that is very hard and filed properly to cut iron.

On the opposite side the stringers are all left intact so that the track cannot go out of line. The new stringer that is framed for the inside, or the one nearest to the center of the track is now brought on the bridge on a small dolly and placed on the ends of the caps outside of the old guard sticks for the entire length of the bridge. Then by the use of some levers and some small track jacks placed on the ends of the caps and the levers between the ties and near the rail, one can lift this rail and the ties enough to clear the old stringer on two bents or more. This allows the old inside stringer to be easily moved in to the center of the track and the stringer next outside to move in to take the place of the inside one. The new inside stick is now pushed under the ties from the outside the entire length of the bridge.

The old inside stringer is now removed by cutting in two and dropped or lowered, to be picked up later. This process is repeated until all old stringers have been removed from one side and the new ones pushed under. These are then spaced to standard requirements and secured to the caps with plug bolts. Lining spikes are put in this new side and the other side loosened up and removed in like manner.

Ties are renewed very much like grade ties are, by taking out one at a time, using small track jacks to lift the rails slightly so that the ties may be removed without much work. By using small levers to lift one rail they do not have to be lowered for a train to pass as a jack would; thus much time is saved where trains are frequent, and the work is resumed as soon as the train has passed.

If caps are not long enough to receive the extra stringer, outside the old outside guard stringer, the new stringer can be moved in and ends of ties sawed off, or a plank can be fastened on the side of cap to receive this stringer. On double-track work it is necessary to move the old guard stringer and saw off the ends of ties to allow an opening to put in the new stringer. If a reduction was permissible the old guard stringer could be taken out before putting in the first new member. This is a small saving of labor, but is not recommended, as bridges are usually run until no reduction in strength of stringers is permissible. As this method does not interfere with the bond of the rails or the removal of the rails at all and requires no work train service or derrick car, it has been found much cheaper than when a work train is used.

If change in elevation or grade is required the capping should be renewed and the old work put into proper line and placed before the renewal of the top is commenced. By this method there is no interruption of traffic and no time is lost waiting for trains.

A METHOD USED ON THE FRISCO

By H. H. Brooke,
General Foreman of Bridges and Buildings, St. Louis-San Francisco, Chaffee, Mo.

One thoroughly tried way to renew stringers follows the general outline following: The new stringers are unloaded on skids as close to the bridge as possible and framed. Next the chord bolts are removed from the old stringers on one side of the bridge as well as the line spikes in the ties. The anchor bolts or drifts are pulled as the old are taken out. The old stringers are removed three or four at a time with a crab mounted on an ordinary push car. They are then piled up on the side of the dump. From three to four new stringers are carried out at a time and lowered in place, keeping a few drifted along to insure against moving of the bents. When trains must be passed the men may be kept busy boring the stringers and bolting them up. After the stringers are in on one side, they should all be bored, packed and bolted up and shifted to the proper bearing. After they are anchored to the caps the track should be line spiked to avoid any trouble with sun kinks, as stringers are usually changed out during the summer months.

I have assembled the stringers on the ends of the caps where I packed and securely bolted them together and then turned them over and jacked them under the track, but this requires a large force of men and I do not believe it pays. With a crab properly constructed on an ordinary push car it is possible to put in stringers with a foreman and 8 men and do the flagging. Of course 12 or 16 men make much better and faster work.

All new stringers when put in place should stand open ½ in. at each joint and be placed at least 1 in. apart. A 3-in. or 4-in. block should be placed between the bulkhead and stringers for air space, as this is where the new stringers need air circulation to keep them dried out. Failure to do this will shorten the life of the timbers.

Water Gas Tar.—The United States Forest Products Laboratory, Madison, Wis., has treated 100 red oak ties with water gas tar and has placed them in an experimental track.

AMERICAN TRACK STANDARDS IN FRANCE

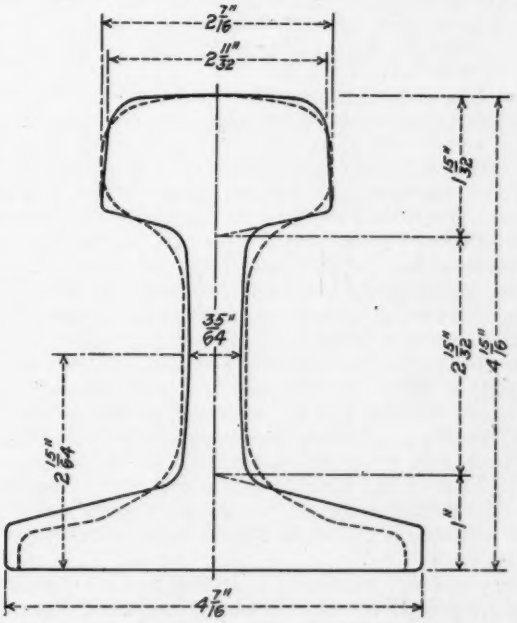
Special Designs of Frogs, Switches and Crossings Prepared to Meet the Conditions Encountered in War

A COMPLETE SET of standards for special track work including frogs, switches, crossings and cross-overs has been developed for use on the railways which the United States forces in France have taken over. The magnitude of the requirements of this character is indicated by the fact that 5,000 turnouts alone were specified in the first order. The designs for this work were prepared under the direction of S. M. Felton, director general of railways for the United States army. He was assisted in the preparation of the plans by A. H. Mulliken, president, and other members of the Manganese Track Society.

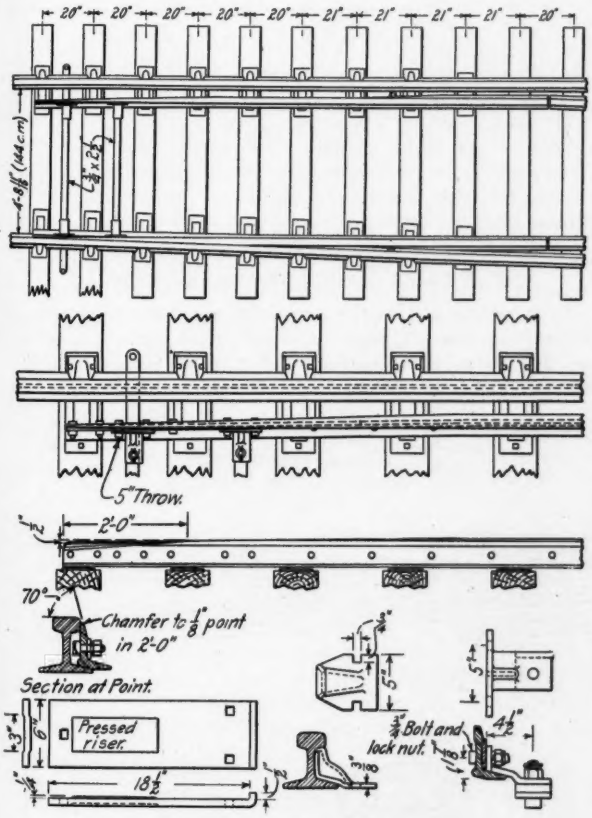
DETERMINATION OF THE DESIGNS

The main considerations which influenced the designs were: (1) Safety for standard railroad traffic based on American railroad practice; (2) economy and simplicity in design to admit of quick production in large quantities for any emergency that might arise; (3) standard sizes of materials that are carried generally in stock or are most readily procurable, and (4) American Railway Engineering Association standard layouts, with switches and frog details developed to meet the above conditions. An effort was also made to eliminate unnecessary cutting of rail in the manufacture of this special work.

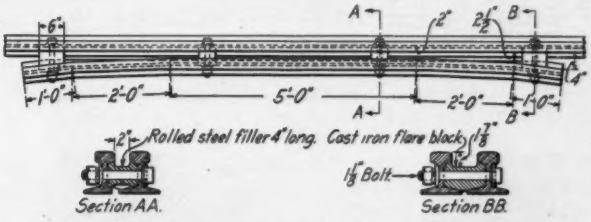
It was necessary to proceed with the work before any really tangible information was available concerning the actual requirements or the nature of the track standards. Some information was obtained regarding materials which the French railways had obtained in this country previously which served as an approximate index. The 80-lb., A. R. A., type "B" section of rail was adopted rather than the French type, being of the same height as the French rail, but better proportioned. The "B" section was selected because of its very heavy base, the government desiring to avoid chances of breakage on account of the rough handling the rail would be subjected to. The rails are laid to the French gage of 4 ft. 8 11/16 in. (144 cm.) and the narrow gage military railways use 25-lb., A. S. C. E. rails laid to a gage of 1 ft. 11⅝ in. (60 cm.). The first standard determined upon was a No. 8 turnout having a 16-ft. 6-in. switch, a No. 8 rigid frog and an 11-ft. guard rail, the No. 8 turnout being adopted because it is not contemplated that any of these tracks will be used for high speed movements. As the work progressed a ground-throw switch stand was determined upon and also No. 8 single and double-slip switches, with the alinement according to the American



COMPARISON OF 80-LB. A.R.A. TYPE B RAIL WITH RAIL USED BY NORTHERN RAILWAY OF FRANCE (DOTTED LINES)



16-FT. 6-IN. SPLIT SWITCH



DETAILS OF THE 11-FT. GUARD RAIL

Railway Engineering Association typical layout, as given in Vol. 17 of the Proceedings for 1916. The government also called for additional turnouts for No. 12 and No. 6 frogs and also for a number of crossings of angles of 45, 60, 75 and 90 deg.

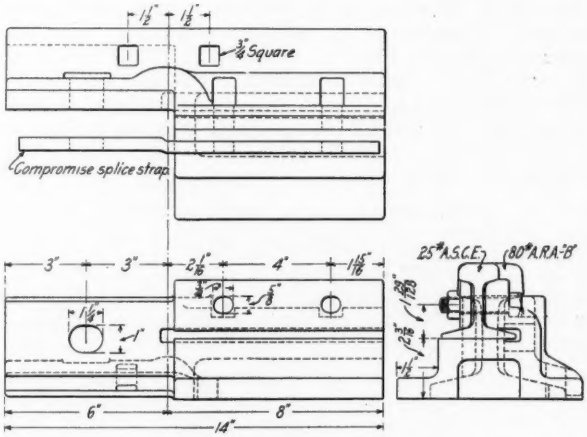
TURNOUTS INVOLVE NEW FEATURES

One of the drawings shows a standard 16 ft. 6 in. switch in which the switch and stock rails are supported on pressed steel slide plates, 5/8 in. thick by 6 in. wide, with pressed risers and with shoulders to hold a pressed steel rail brace. (The manufacturers were given the alternative of providing ½-in. slide plates with solid braces of malleable iron.) Two ¾-in. by 2½-in. connecting rods are attached to the switch rails with pressed steel open side pockets. The switch rail is braced by ⅜-in. reinforcing bars, 13 ft. 5 in. long. The throw is 5 in. and the heel distance 6¼ in.

The frog embodies a number of interesting features. It is built of standard 80-lb. rail with cast iron throat blocks, rolled steel fillers and a heel riser made of a rail with the head and base pressed to the desired shape. The design of the point is a special feature. The web and base of the point rail extend 4 in. beyond the actual point, the head being cut away on a curve of 15-in. radius. This arrangement has the advantage that an additional bolt can be passed through the point rail and the fillers and it eliminates the notches in the fillers at the point of frog. Another effective detail is the planing of the flares in the heads of the wing rails in place of producing the flare by bending the entire rail. The advantages of this are that the standard rolled fillers can extend to the end of the wing, thereby eliminating the foot guard and that additional strength is secured by the use of bolts near the extreme end of the wings. The length of the frog is 13 ft. 6 in.; the bolts are of 1⅛ in. open hearth steel; the throat distance is 1⅞ in. to 2¼ in. and the flangeway is 1¾ in. wide.

The guard rail was made 11 ft. long to secure three of them from a 33-ft. rail. It has a compound flare, the main flare being ½ in. in two feet and the end flare 1½ in. in one foot. The guard rail is secured to the running rail by four 1⅛-in. bolts with cast iron flare blocks at the end and rolled steel fillers 4 in. long for the intermediate bolts. The use of guard rail clamps was considered when the design was being made, but it was decided that it would be unwise to employ them for the service imposed because of the difficulty that might arise from the loss of loose parts of clamps. With the type selected, the guard rail can be shipped complete with bolts and fillers in place and there is no opportunity for the loss of any parts.

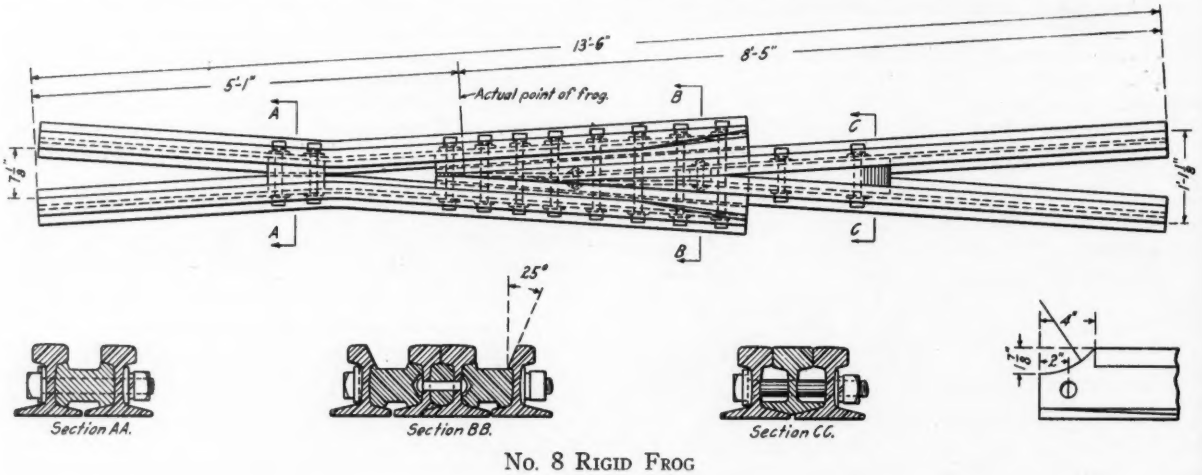
Drawings were also prepared for a standard No. 8 turnout and a No. 8 crossover. These correspond very closely to the standard plans given in the Manual of the American Railway Engineering Association. The lead, tie spacing and other principal dimensions are identical, but in general the ties of the government turnout and crossover are 6 in. shorter than those shown on the American Railway Engineering Association plans. The standard switch stand is of the dwarf, parallel, ground-throw, Mansfield type, without provision for switch locks. The cover casting bears the marking 1917, U. S. A.



COMPROMISE JOINT FOR 25-LB. A.S.C.E. AND 80-LB. A.R.A TYPE B RAILS

THE CROSSINGS ARE INTERCHANGEABLE

In connection with the crossings an intricate problem arose from the fact that the government engineers could not definitely determine the number which should be right hand or left hand, the principal crossing requirements be-

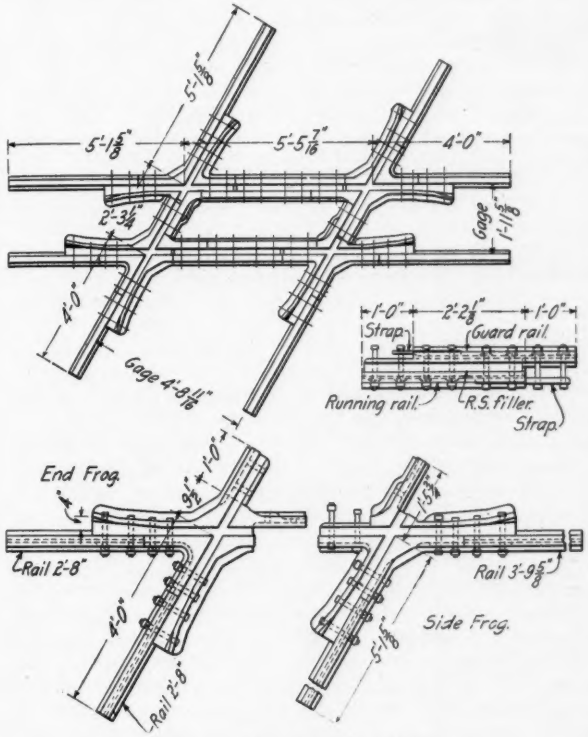


NO. 8 RIGID FROG

ing for the passage of narrow gage tracks over those of standard gage. In consequence of this situation it was deemed highly desirable to work out some scheme by which the crossings could be made reversible, that is, designed in such a way that they could be changed from right to left hand by a reassembling of the pieces. After

a study of the problem, the conclusion was reached that this could only be solved in a practical way by making the angular crossings of cast manganese steel. In general it was the idea in connection with this track work that the conditions imposed by the service did not demand the use of manganese steel, but owing to the peculiar problem imposed in the crossings an exception was made in that case.

One of the drawings shows the details of the 60-deg. crossing and illustrates how the special requirements were secured. Each crossing consists of two manganese steel end frogs and two manganese steel side frogs. The interior arms of these frogs are of such length that, when directly connected, they produce a complete crossing of



REVERSIBLE MANGANESE CROSSING

one narrow gage (60 cm.) track over another. However, two sets of connecting rails are provided with each crossing, each connecting rail consisting of a running rail, guard rail and filler. When these are inserted between the frogs on the rails of one track, the crossing becomes standard gage for the opposing track. The crossing can be made right hand or left hand, depending upon which pair of the rails these connecting rails are inserted in. By procuring two more sets of connecting rails the crossing can be made standard gage for both tracks.

It is expected that most of the narrow gage track used in France will be of the portable type fabricated in sections with steel ties, each section of track having square ends. To facilitate the connection of such tracks to the crossings the exterior arms of the crossings are fitted with short sections of rail of such length that square ends are secured, when either or both tracks are for narrow gage.

The crossings were detailed to correspond to 80-lb. A. R. A., type B rail, and as connections must be made in the narrow gage track to 25-lb. A. S. C. E. rail, four sets of compromise joints were provided with each crossing. This unusual jump in the sizes of rail called for the design of a compromise joint that is rather out of the ordinary and it is shown in one of the drawings.

SLIP SWITCHES

In the single and double slip switch designs, the frogs and switches are duplicates of those for the standard No. 8 turnout. The plan also provides that the joint in the stock rails coincide with the heel of the switch rail so that the two joints can be made with the use of a common 22-in. cast iron heel block. Provision against rail creeping is made by means of a ½-in. by 2-in. by 4-ft. 4-in. anti-creeper attached to this joint and extending over three ties. The knuckle rails and movable points are reinforced with easer rails. Both the double and single slip switches are provided with double hand throw devices interlocked to insure that the movable points will be in proper position for the routing given by the position of the switch point.

RAILWAY NEWS AT WASHINGTON

THE MOST RADICAL STEP which the railways have yet taken to meet the present unusual demands which are being made upon them was announced on November 24, when the Railroads' War Board directed "that all available facilities on all railroads east of Chicago be pooled to the extent necessary to furnish the maximum freight movement." The effect of this plan will be to operate these railways as a unit regardless of their ownership and individual interests. A committee consisting of the operating vice-presidents of these eastern lines, with A. W. Thompson of the Baltimore & Ohio, chairman, has been given instructions and authority to adopt all measures which in their judgment may be necessary to relieve the present situation and to insure the maximum amount of transportation. The facilities of the railways in other territories were also placed at the disposal of this committee at the same time to such an extent as may be necessary. In accordance with this latter provision over 100 locomotives have already been transferred from western roads to those in the east.

A number of important measures have already been put in effect to reduce the congestion. As far as possible freight is being diverted away from the Pittsburgh territory and other points of congestion. Large quantities of foodstuffs and other export materials normally moving to eastern seaports are being routed through southern ports. The trackage of various parallel lines is being pooled to provide multiple track operation where this will increase the capacity. The Broadway Limited, the Pennsylvania 20-hour train between New York and Chicago, was discontinued on December 1, to give greater opportunity for the handling of freight. A sub-committee on overseas traffic has been organized to exercise control over all freight intended for export to prevent a further congestion of materials awaiting shipment at tidewater.

As about 80 per cent of the coal mined in the United States originates on the roads represented by the committee it has agreed to pool all coal-carrying cars on the roads represented by it, which will eliminate a large amount of switching and interchange of equipment. An embargo has also been placed against all intracity freight movement and intracity reconsignments in a number of the large eastern cities. These and other measures have already reduced the congestion of the Pittsburgh district to such an extent, at the time of going to press, as to enable the roads to lift the embargo on traffic going through that gateway partially.

Government control of railroad operation for the duration of the war, probably under the direction of a general railroad administrator with a guarantee of earnings, is expected to be the policy decided upon by President Wilson to handle the present railway situation. At the time of going to press he was expected to go before Congress soon after the Christmas recess to lay his plans before that body and to secure increased authority for the steps he desires to take.

The question whether the railroads should continue to be controlled by their own managements or whether they should be taken over and operated by the government has been under consideration by the President for several days. It is understood that, while opposed to the idea of government ownership, the President feels that government authority is essential to the complete unification of the country's transportation system which the Interstate Commerce Commission declared "indispensable to their fullest utilization for the national defense and welfare."

In a letter dated December 10, addressed to Senator Newlands, chairman of the Senate Committee on Interstate Commerce, Fairfax Harrison, chairman of the Railroads' War Board, pointed out that the American railroad system has not broken down, but that on the contrary it is handling 50 per cent more business than in 1915 without material enlargement of plant. The difficulties are of an operating character incident to the handling of a volume of traffic greater than the capacity of the plant in certain limited territories, aggravated by the excessive use of preference orders for the handling of government business.

The railways urge the immediate appointment of a traffic officer to determine the relative priority of government traffic and to avoid the present excessive use of preference orders which tend to congest the movement of freight. The railways further ask for priority orders enabling them to secure the prompt delivery of cars and locomotives ordered, but still undelivered, and the manufacture of additional equipment which they now desire to order. Mr. Harrison also stated that the American railroads under their present management are prepared to furnish all the transportation which the existing plant can produce under any form of management. They are already prepared to make common use without reservation of all facilities, power and equipment.

The Distribution of Labor and Material*

By J. T. Bowser,
Maintenance of Way Department, Southern Railway, Danville, Ky.

IN ITS OWN PLACE in the records of railroads, the distribution of the labor and material expended and used by employees, is fully as important as the time roll or record of time made by the individual employee. The foreman's records of labor and material distribution usually consist of a daily report and a monthly report, the former commonly being made in connection with the daily time report and the latter in connection with the monthly time roll or time book.

The daily distribution report is usually required primarily to give prompt information of the expenditures on appropriations of labor and material for maintenance or for other special purposes, so that those responsible for the expenditure of such appropriations may see that they are not exceeded, or that the total amount appropriated may be used to the best advantage. These reports further serve as a check on the distribution given in the monthly reports, and are available to reconstruct monthly reports of distribution should the latter be lost or destroyed before they have been compiled and have passed into the records in the accounting offices. The monthly distribution report, which is usually embodied in the foreman's monthly time book, is the ultimate source and foundation of the most important accounting records in the department, and as such should be as nearly exact as may be possible.

For the sake of obtaining a clearer understanding of the proper method of making these distributions, and the necessity of absolute accuracy in their preparation, it will be well to consider the reasons for which the distribution is required in the form prescribed for the foreman's reports.

These reasons may be roughly classed under four heads: (1) That information as to the cost of the various classes of work may be available for the guidance of operating officers who are responsible for the efficient and economical operation of the road. (2) That figures showing the earnings and expenses may be had by the officers responsible for the finances of the road. (3) That bills may be made in intelligible and checkable form, against other railroads, corporations, or individuals on whose account material is used or labor expended. (4) That reports of earnings and expenses may be made to the Interstate Commerce Commission in the form prescribed by that body.

The first requirement, the distribution of labor and material expenditures, when compiled for the entire road, places in the hands of the officers responsible for operation, information as to the cost of each feature of maintenance of way work. Thus, if the statistics show that the average cost, for a period of a month or a year, to place a new tie in the track is two cents higher than normal, steps may be taken immediately to ascertain the reason and to get the cost back to where it should be. Considering a single tie or a single section this is a small matter, but not so when the whole road or the whole system is considered, where the ties renewed run into the hundreds of thousands. Similarly, if the total cost of labor and material charged to maintenance of way and structures on one road or division is 18 or 20 per cent of the total cost of operation, while on another operating under similar conditions, this cost is only 12 or 15 per cent of the total cost of operation, it is time for the officers at the head of the operating department to know it, to know in just what class or classes of maintenance expenses the excessive cost is to be found, and to know why these costs are excessive.

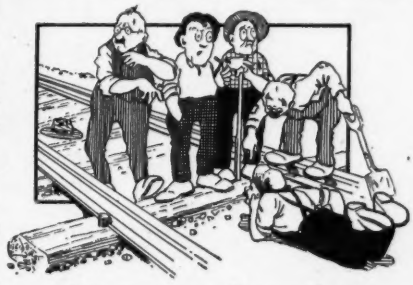
With reference to the second reason, those responsible for the finances of the road must have information concerning the earnings and expenses available in sufficient detail to enable them to take such steps as may be necessary to keep a safe margin between the two.

Reason No. 3 explains itself. A railroad, like any other corporation or individual, wants and expects value received for the expenditure made by it, and the other party on whose account the work is done expects bills

*The first article of this series appeared in the issue of December, 1917, page 381.

to be made in a form that can be readily checked and distributed through their own accounts.

Referring to the fourth reason, through laws passed at various times by Congress the Interstate Commerce Commission was created and has been empowered to require such reports of the railroads of the country as will enable the commission to exercise a certain amount of supervision over the financing of the railroads, and to regulate freight and passenger rates. Therefore, in order that the commission may be kept informed of the financial condition of the railroads, it requires reports in detail of all earnings and expenses, and these reports are required to be made in a form that shows a careful classification of all expenditures.



"CONSIDERING A SINGLE TIE"

All of these requirements made necessary the fabrication of an elaborate structure of accounts, the foundation of which (in the maintenance of way department) is the foreman's report of the distribution of labor and material expenses.

The form in which this informtaion is required by the Interstate Commerce Commission is so well designed and covers all the ground so well, that it answers practically every requirement of railroad accounting, so that the forms in which foremen's reports are required, and the methods of accounting on nearly all the railroads in the United States, are based on the forms prescribed by the commission. This being the case, a discussion of the distribution required by the commission will, in general, cover the reports required of foremen on all roads.

That portion of the accounting system with which we need to concern ourselves in this discussion may be properly divided under four heads: Operating expenses, physical property, materials and supplies, and individuals and corporations. Under these four heads falls every division of expense which foremen are required to make.

Under the head of "operating expense" comes every expenditure for the upkeep or maintenance of the property used in the operation of the road. This expense, since it does not represent any addition to the property, can in no way be considered money invested, and is therefore entirely distinct from the physical property account.

To "physical property," or capital account, as it is sometimes called, are charged all expenses incident to the purchase or construction of additional property, or for the extension or enlargement of existing property, up to the time it is put into operation or can be considered as completed, after which expenditures thereon are charged to operating expenses. In other words, to this account are charged all additional investments of capital, as opposed to the expense of maintenance which does not represent additional capital invested, but is simply a portion of the cost of operation.

Thus it will be seen that the labor and material used must be so reported that the cost of maintenance may be separated from the cost of new work, construction, or additions and betterments as it is variously known, so that the cost of improvements may be added to the value of the property, and so that the cost of maintenance may be included in the cost of operation, and the true financial status of the road may be known by the railroad officers interested and by the Interstate Commerce Commission.

The labor and material expended on the account of individuals and other corporations go first as charges to some of the sub-accounts under operating expenses or physical property, and are afterward credited to the same accounts, when a bill is made against the party for whom the work is done, so that these charges also must be properly distributed.

The general account "materials and supplies" should show at all times the amount of money invested for this purpose, and should represent the value of the material actually *on hand and not in use.* By the classification of these materials and supplies, those responsible for their purchase and distribution may avoid overstock and shortage, and may shift a surplus at one point to supply a shortage at another. To this account is charged the value of material purchased and to it is credited the value of all material used, so that it should reflect at all times the value of the material on hand. Whether or not it does show correctly the value of materials on hand depends largely on whether the foremen promptly and properly charge out or report the material used, for, unless they do make correct reports of the material used the account cannot be credited with the value of such material, and it will thus stand charged with more or less than the value of the material on hand.

So much for the four main heads in general. Now for the detail, the many accounts and sub-accounts under each. "Materials and supplies" need not be considered further in this article since it is affected by distribution only so far as having material and supplies charged out or credited to it as they are used. The necessity for distribution under individuals and corporations has already been explained. Operating expenses and the property account are other matters, however.

"A DISCUSSION OF THE DISTRIBUTION"

Why not just lump all charges for maintenance under operating expenses and all costs of additional property under the property account? Why all the hundred odd divisions? Because, except for a general idea as to the relation between the earnings and the cost of operation, the accounts would then be of no practical value. The cost of operation might increase out of all proportion with an increase in earnings, and there would be no means of knowing in just what portion of the cost of operation the increase could be found. Consequently the reasons for the increase could not be known with any degree of certainty, and steps could not be taken to get the particular class or classes of expenses down to normal. Or if the Interstate Commerce Commission did not

require the detailed distribution of costs and the railroad did not keep them, and the railroad, finding that it was not making money, went to the commission to ask for permission to increase freight rates, the commission might well say: "You have your operating expense here simply as a total. It is not itemized in such a form that we can tell anything about it. How are we to know that your affairs are not grossly mismanaged? Is the public to pay for the cost of mismanagement?" On the other hand, when this expense is properly classified, evidence of mismanagement, if there is any, would be found by making comparisons with figures for previous periods or with costs on other roads, long before it became necessary to ask for increases in rates. Or, if mismanagement is not responsible for the reduction in profits with the details of costs at hand, the road would have a very much better case to present. The railroad's representatives could then say, in effect, "We are not making a fair profit on our investment. The cost of operation has increased all out of proportion with increases in earnings. The increases are largely in such and such accounts. They are entirely legitimate and are in no way due to poor management. You will find that the increases in these accounts show up in similar accounts on other roads operating under conditions similar to ours. We must have an increase in freight rates if we are to keep going. We must make money or we cannot serve the public."

"EVIDENCE OF MISMANAGEMENT"

With a similar distribution, under the various accounts embraced in property account, excessive costs in any phase of the work may be detected and the improper conditions corrected, while a record of the cost of each class of work is available for future reference. The commission may be satisfied that there has been no padding of the property account by charging to it costs that should have been charged to operating expenses, with the view of showing a decrease in the cost of operation and a consequent false increase in net earnings, thus enhancing the value of the stock and making a false representation to investors.

It is true that for some foremen this will have but a general interest, for on some roads no distribution is required of them so far as the various accounts are concerned, the distribution being made in the office, and the foreman only writing out in detail just what his gang does each day. But on the majority of roads the distribution by accounts is required in the time book, more or less similar to the form shown, but all based on the same principle, and a close study of the whole system of distribution will show it to be an outline of the entire maintenance of way department. Its very completeness makes it fascinating and worthy of study. In conclusion—the need of accuracy is paramount. An inaccurate record is worse than no record at all. Foremen should realize that their reports are the basis of some very important records, and that it is up to them to make these valuable or of no value at all.

WILD LIFE IN ALASKA.—While a track gang on the Alaskan Government Railway was engaged in laying rails on the main line near Mile 195, a brown bear came out of the woods and attacked one of the laborers, chasing him down the right of way. Fortunately, one of the men in the gang had a rifle and succeeded in killing the animal before anyone was injured.

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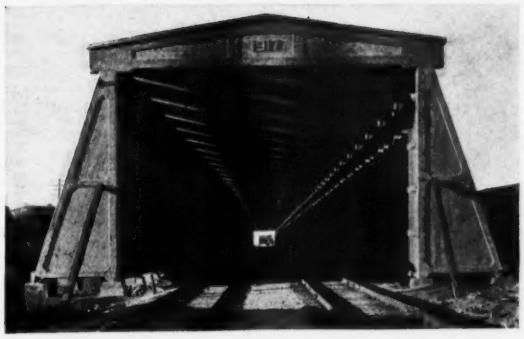
FRENCH TROOPS CONSTRUCTING A RAILWAY BACK OF THE FIRST LINE IN THE AISNE DISTRICT



Portal of a Union Pacific Snow Shed

A Comparison of Two Forms of Snow Shed Construction

Radically Different Types Built to Protect Great Northern From Slides, and Union Pacific From Drifts

WHILE THE BUILDING of snow sheds is ordinarily handled by the construction branch of the engineering department, the conditions which make them necessary are those which confront maintenance of way men directly. It is these men who are called on to keep the line open for traffic and who are required to fight snow, either drifting or in the form of slides. The construction of sheds reduces the problem of maintaining traffic to a marked degree. For this reason the construction of snow sheds of two radically different types to protect against snow troubles of entirely different character on two western roads is of interest to the readers of the *Railway Maintenance Engineer*. The Great Northern completed 3 miles of timber and combination timber and concrete sheds on the west slope of the Cascade Mountains last year to protect its lines from frequent heavy snow slides while the Union Pacific has just finished the construction of 8,270 ft. concrete sheds and 1,779 ft. of timber sheds in Wyoming designed solely to prevent trouble from drifting snow.

THE GREAT NORTHERN SHEDS

The Great Northern built 14,560 ft. of snow sheds, 281 ft. of concrete arch and 2,519 ft. of tunnels in the Cascade mountains during 1916. Including the work previously done, 8.4 miles of line is now entirely protected from the snow in this vicinity. Of this amount 6.4 miles is west of the summit and, including a spiral tunnel, a total of 6.7 miles of track is now under cover in a distance of 9 miles. The longest continuous section of snow sheds is 9,790 ft. The western slope of the Cascade mountains is subject to very heavy snow fall, which, in combination with the Chinook winds which cause sudden heavy thaw, causes many slides.

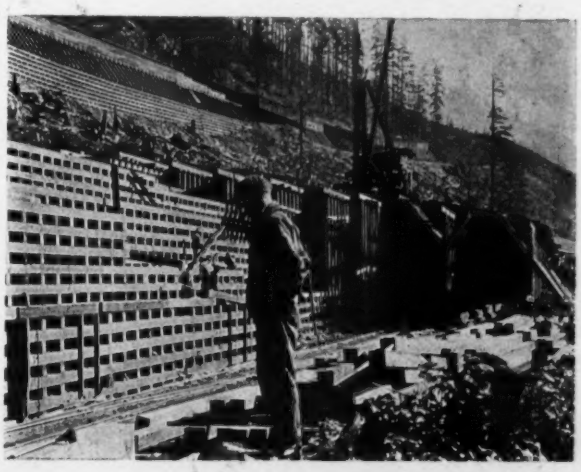
Three Types of Sheds Were Tried

The early snow sheds were all of timber construction, but in 1910 and 1911 a total of 2,462 ft. of double track reinforced concrete sheds was constructed. This type has not been used in subsequent work because of its expense. In 1913, 14,594 ft. of snow sheds was built, of which 10,094 ft. was of all-timber design and 4,500 ft. was of a composite design, with a timber roof over the tracks and a retaining wall of plain or reinforced concrete on the uphill side to take the place of the extensive timber work required in that position in the all-timber design. In 1916, when a total of 14,560 ft. of sheds was built, 12,309 ft. was of the all-timber design, while only 1,970 ft. was of the combination type. Besides these a total of 281 ft. consisted of reinforced concrete arches serving as extensions for three tunnels built for protection purposes.

Thus there has been an almost complete return to the original form of construction. The principal reason for this is the high cost of reinforced concrete as compared with timber at a point located in the heart of the Douglas fir region. Also the old timber snow sheds can be built in less time than either the all-concrete or the combination sheds, a factor that was of no little importance in planning the completion of the construction program in the short working season.

The bulk of the snow shed construction has been west of the Cascade tunnel. For the entire distance between the tunnel and Scenic the line occupies a mountain side that has been swept almost bare by repeated slides. Between Windy Point and Scenic the two higher legs of a double loop are located on benches in the same slope, one above the other so that the line is twice exposed to the same slide.

The shed serves essentially as a chute to conduct the masses of snow, ice and debris from the hillside above the track to the slope below. It must serve to resist the impact of a rapidly moving mass that remains on the roof only momentarily and it must be able to carry the dead weight of a slow-traveling bank of snow that may con-



Great Northern Timber Sheds Under Construction

centrate on the roof and remain there until the summer sun melts it. Of great importance in the design is the resistance to the sliding action, which in the all-timber sheds necessitates the use of ample sway bracing and a set of batter posts on the down hill side, acting in conjunction with knee braces in the openings over the tracks.

To form an effective chute for the snow the shed construction must be extended up the hill until the plane of the new roof intersects the mountain slope. If the slope is steep this is accomplished readily, but when it is flat the wide extension of the structure required in the all-timber design entails the use of large quantities of lumber. The combination shed overcomes this by introducing the retaining wall of either mass or reinforced concrete, the

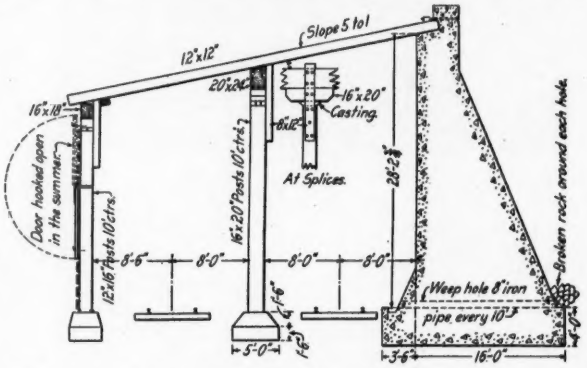
space behind the wall being filled to the desired slope with earth.

One feature requiring special treatment is the drainage of the mountain side to carry away the water from the melting snows. Where the discharge is small this can be accomplished readily in the all-timber design by building a flume on the roof of the shed, but the demands of permanent construction in keeping with the design of the combination sheds require something more substantial. One solution is the use of a concrete box culvert passing underneath the shed as shown in one of the drawings.

LARGE AMOUNT OF LUMBER REQUIRED

Some idea of the magnitude of the project can be obtained from the fact that 37,550,000 ft. b.m. of lumber was required to complete last season's work. The progress in the shed construction on the west slope was about 24 track feet per day, which, with an average of 2,000 ft. b.m. of lumber per track foot of shed was equal to a daily consumption of 48,000 ft. b.m. of lumber. The site of the work did not afford any storage space, so all lumber received from the mills had to be sorted in a yard, 40 miles west of the work. On the east slope the situation was much more favorable, as a yard could be located more centrally. The concentration of lumber at these two storage points was commenced some time before the construction started in order to insure a supply that would preclude any delays to the work.

All of the work was done by contract. The railroads furnished the lumber and paid the contractors on the basis of the amount of lumber erected. The railroad engineering force made up a complete bill of all lumber, showing the actual feet b.m. of all the lumber placed as well as the commercial feet b.m. delivered. This billing



TYPICAL CROSS-SECTION OF THE COMBINATION SHED

was made up by the inspector as fast as the material was erected or was secured by means of a survey of the completed work.

West of the summit about 200 men were employed on the timber sheds, 130 on the combination sheds, 230 on the tunnel work. The timber was erected by stiff leg derricks mounted on skids on the roof of the completed shed, so that they could be moved forward as the work progressed. Only a small amount of framing was required and this was done on the ground just previous to erection. Holes were drilled with power-driven tools.

GREAT NORTHERN SHEDS ON TWO LEVELS NEAR MARTIN CREEK LOOP

From the storage yards the cars were loaded with pieces substantially in the quantity and order used daily in the construction of the sheds, and as the erection crews were working simultaneously at a number of sheds and had to be served almost constantly, a large amount of work train service was required. On the west slope this was equal to an average of four work trains daily in addition to a train supplying concrete materials. About 1,000 cars of sand and gravel were required for the concrete in the retaining walls of the combination sheds and about 2,500 cars of timber.

The plant for the construction of the concrete walls consisted of two bins, one for sand and one for gravel, standing on a framework of sufficient height so that a mixer receiving materials by gravity from the bottoms of the bins could discharge concrete directly into cars stand-

ing on a track well above the top of the wall. These bins were filled from cars by a clam-shell bucket hoisted by a stiff-leg derrick standing on a platform spanning the main track. The cement was elevated from a storehouse alongside the track by means of a chain conveyor.

Concrete was delivered to the forms in small narrow-gage dump cars operated on a trestle supported over the wall by frame bents that were placed astride of the forms. The cars were moved back and forth by a hoisting engine and cables. The location of the plant was generally made central with respect to the length of the shed so that the concrete cars moved both ways from the mixer, thus reducing the length of haul to a minimum.

The forms for the wall were made in sections that could be taken down and re-used repeatedly. To facilitate the moving of the forms a gantry was built to travel on the trestle on two rails laid as far apart as possible so that the concrete cars could pass underneath the gantry without interference.

THE UNION PACIFIC SHEDS

Sixty-mile gales, continuing for weeks, swept snow across the wide stretches of rolling plateau west of Laramie, Wyo., last winter and caused repeated interruptions to the heavy transcontinental traffic of the Union Pacific in spite of the efforts of the operating and maintenance departments. Trains were blocked so often by drifting snow while taking coal and water at Rock River, Wyo., that 1,200 ft. of timber snow sheds were built in the midst of the stormy weather under very trying circumstances to alleviate the conditions at that point. The trouble started about December 20, 1916, with the fall of 12 to 14 in. of snow. This was the heaviest snowfall of the winter, but the conditions experienced were at no time caused alone by the depth of the snow. Instead they were brought about by the almost incessant west and northwest winds which kept bringing fresh supplies of snow across the many miles of open country. The initial trouble occurred in the 18 miles between Rock River, Wyo., and Medicine Bow, and as the severity of the winter increased it was extended westward 20 miles to Hanna, and eastward 20 miles to Bosler. At one time snow troubles were experienced as far west as Tipton.

The condition encountered may be described as an almost steady stream of snow-filled air, traveling at velocities as high as 60 miles an hour, which formed deposits against any obstruction placed in its path. Under such circumstances the railroad cuts were the source of much trouble, but even a standing train would stop so much snow that drifts would form around the wheels to a sufficient extent to block the train in the space of time occupied in taking water and coal.

Another peculiar phenomenon was the blowing of sand. At one time during the month of February six inches of sand, containing no small quantity of alfalfa hay, roots and all was deposited on top of the snow drifts in White Rock cut, five miles east of Rock River.

RAILROAD MAKES A HARD FIGHT

The fight to keep the line open began after the snowfall in December, and although no general tie-up of traffic occurred, it was necessary to continue the struggle for three weeks. Some additional snowfall with a renewal of the wind late in January called for renewed efforts, and with the gradual filling up of the cuts and the repeated passage of the snow plows, the difficulties were greatly increased so that the month of February was one long struggle. Portions of the line were blocked repeatedly for short intervals, but there were only two general blockades, one of two days and another of three. However, it required increasing efforts with an ever-increasing organization to keep the trains running, until finally over 800 men, including the section crews, were employed in the 50 miles between Lookout and Hanna.

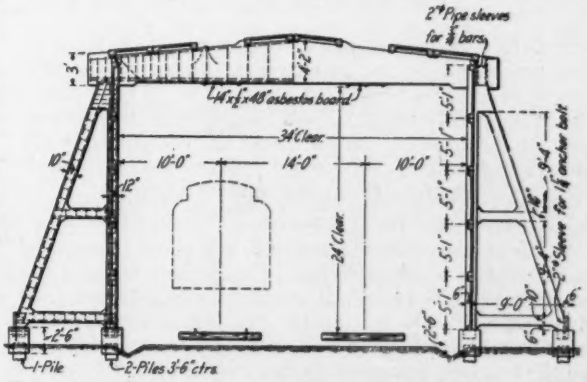
The difficulties of the work were aggravated by cold weather. A minimum temperature of 21 deg. below zero was attained and for six weeks the temperature did not go above zero. The troubles with the standing trains at Rock River became so severe that it was concluded to commence the immediate construction of a timber snow shed covering the tracks each way from the coaling station.

QUICK WORK ON TIMBER SNOW SHEDS

The frame snow sheds are intended purely for protection against blow snowing. The winds causing the snow trouble were westerly (the line at Rock River runs north and south so that it was not necessary to provide any protection on the east side.

Twelve hundred feet of this form of shed was built during the severe weather in February. To as large a measure as possible, the material was prepared for ready erection before arrival at the work. The columns and bases and the trusses were framed at Cheyenne, 100 men being employed on this work, in addition to 100 men used on the erection. The sheds are supported on pile foundations, the piles being driven a sufficient time in advance to keep ahead of the erection work.

The experience of the winter, the expense of maintaining large forces of men to keep the track open, the interference with traffic and the danger of serious blockades led to the authorization of the construction of 8,270 ft. of permanent snow sheds. Subsequent study indicated the advantage of reinforced concrete, pre-cast in units and erected. Of the total amount of shed the largest single section is at Rock River, where there is a length of 4,441 ft. All of the timber shed constructed during the winter is retained in service except that the south 700 ft. was taken up and moved to the north end and it was further extended to make a total of 1,779 ft.



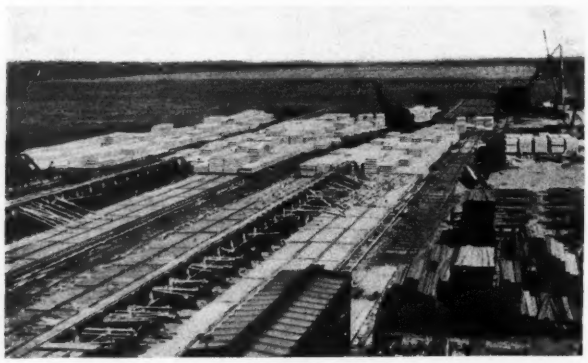
STANDARD SECTION OF THE REINFORCED CONCRETE SHED

THE CONCRETE SHEDS

One of the drawings shows the standard design for two tracks, which is in reality a simple structure, consisting primarily of a succession of concrete bents or frames erected along the track every 15 ft. Each bent consists of two unsymmetrical A-frames, supporting a reinforced concrete girder spanning across the track. The space between the vertical legs of the A-frame and between the tops of the girders is enclosed by reinforced concrete slabs.

Responsibility for the success of the design is due in a considerable measure to the details of the connection between the units, which afford adequate load-carrying capacity while permitting ready erection. The footings were fitted with pockets to receive the bottoms of the A-frame legs. The joints between the uprights and the girders are protected by lugs cast on the underside of the girders on both sides of girder bearing. The sides of the A-frame columns perpendicular to the tracks are equipped with grooves to receive the ends of the side slabs as they were slid down into position from the top.

About 75 per cent of the concrete snow sheds at Rock River and all of the sheds at the other sites are supported on natural foundations. For the other 25 per cent at Rock River the tracks are on an embankment so that



CONCRETING AND CURING YARD AT ROCK RIVER

piles were necessary to reach solid ground. Soil conditions precluded the use of untreated timber so concrete piles were used in lengths of 15 to 30 ft. The footings for the natural foundations and the caps for the concrete piles were concreted from a mixer set up alongside the track, using temporary runways between and across the tracks to reach the sites of the various footings.

UNITS MANUFACTURED AT A CENTRAL PLANT

All of the unit concrete was cast in a plant installed by the contractor at Rock River. The project entailed the casting of 12,300 cu. yd. of concrete in 10,313 units, or an average of only 1.2 cu. yd. per unit. The concrete was a 1-2-4 mixture. Including the concrete in the piles and the footings a total of 20,000 cu. yd. of concrete was poured.

The concrete plant covered a large rectangular area served by a grid of tracks placed parallel to each other and from 50 to 80 ft. apart. The mixing plant occupied the center of the site between the two middle tracks which were used for the delivery of materials, while the concreting and curing yard occupied the rest of the area on either side of the mixing plant. Concrete mixed by two 22-cu. ft. cube mixers was hoisted up a duplex tower 132 ft. high, from which it was spouted to two auxiliary towers 82 ft. high on either side. From each of these in turn the concrete was spouted to hopper cars standing on narrow-gage tracks occupying frame trestles about 10 ft. high which were located parallel to and about half way between the various tracks serving the yard. These hopper cars delivered the concrete to any part of the yard and spouted it to the forms.

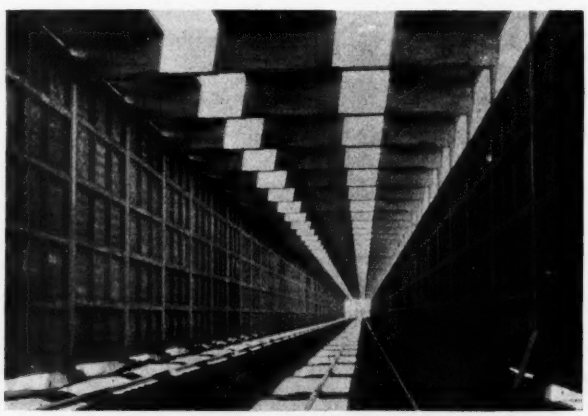
The average output of the concrete plant was from 200 to 250 cu. yd. per day. All concrete materials were handled mechanically. Sand and gravel were delivered on cars alongside the mixer house in bottom-dump cars so that they could be emptied into two track hoppers. From these the materials were elevated by two belt bucket hoists to separate bins above the mixer. All of the gravel passed over a grizzley so that stones over-size could be separated and passed through a No. 2 Gates gyrator crusher and dumped back into the track hoppers. A 16-in. conveyor belt on which the cement and hydrated lime were carried from the cement storage to the charging floor of the mixer hoist is also shown. The handling of the cement was also facilitated by the use of a belt unloader for the removal of the bags of cement and lime from the cars.

All parts of the forms were cut to templets and put together on assembling tables, thus eliminating all measuring after the pattern form had been made for each style of concrete unit. The forms were oiled preparatory to each pouring of the concrete with a paraffin base oil.

The wall and roof slabs were removed from the forms and placed in the storage yard after three days and the girders and columns after seven days. All units were cured in the storage yard at least two weeks before removal for erection, and were kept moist by sprinkling during the entire period.

ERECTION METHODS

The general methods of erection were adopted. At Rock River the erection equipment consisted of a special stiff-leg derrick with a 96-ft. steel boom on a triangular steel frame equipped with rollers. The machine was rolled on blocking on the north side of the tracks at a sufficient distance to clear the tracks and structure. A temporary track was built in the path of this derrick for the delivery of the units on cars. The length of the boom was sufficient to permit the erection of 60 lin. ft. of shed from a single set-up and the speed of erection was



INTERIOR OF A UNION PACIFIC SNOW SHED

such that the derrick was shifted about once each day. At the three other snow sheds, all of which are located in cuts, the erection was carried on by the use of locomotive cranes.

The joints between all units of the structures were treated with cement mortar or asphalt or a combination of the two. The beds of the A-frames in the footing, of the girders on the columns and of the roof slabs on the girders were covered with a layer of cement mortar before the units were placed. The longitudinal joints between the roof slabs were closed with mortar, but the transverse joints in the slabs over the tops of the girders were filled with asphalt. This material was also used in the joints of the side wall slabs in the grooves of the columns.

The work on the reinforced concrete sheds was commenced on May 20, when the contractor moved in his equipment; by August 6 the plant had been completed and forms had been built so that the concreting could be commenced. The erection of sheds was started on August 20. From 350 to 400 men were employed on the work. Eighty men on the forms, 30 on each mixer and 20 for each erection gang comprised the principal units of the force. One rather unusual arrangement of the contract was that the railroad company boarded the contractor's men.

The reconstruction of the wooden sheds was carried on by company forces. Besides shifting the sheds further north and the construction of about 500 ft. in addition, this work included fire protective measures, that is, the covering of all of the truss members with cement mortar placed on expanded metal lath.

PAINTING INTERIOR WALLS*

By C. H. Hall

General Superintendent, Patten Paint Company, Milwaukee, Wis.

IN DISCUSSING THE SUBJECT of the painting of interior walls the interest of the railway painter is largely or entirely in oil paints and enamels, and not in water paints and kalsomines. In consequence the subject will be considered entirely from the standpoint of the former. It is assumed further that the railway painter is interested principally in the use of light tinted paints and as these require the use of white pigments, white lead, zinc oxide and lithophone are the pigments which must be used for the base.

The properties and characteristics of the first two are too generally known to necessitate further discussion. Lithophone, however, is not as well known a pigment and a full discussion of its properties and characteristics may prove of interest and profit. The discovery of lithophone is credited to Orr, an Englishman, in 1874. It was used to a greater extent in England and on the Continent than in the United States, and even up to 1902 its consumption here was very small. By 1908 it was being used in the United States at the rate of about 8000 tons per year, while it is estimated that in 1917 the consumption will be in excess of 50,000 tons. About 50 per cent is used in the paint trade, 35 per cent in the rubber trade and the balance in oil cloth, etc.

The composition of the material is approximately 72 per cent barium sulphate, and 28 per cent zinc sulphide and oxide, the latter being present in small quantities, due to the decomposition of the sulphide during the heating process. In color the pigment is much whiter than white lead and about equal to the best grades of french process zinc oxide. The texture is more nearly similar to lead than to zinc oxide. Its color is unaffected by sulphur or hydrogen sulphide because it is already a sulphide combination. It is somewhat less active chemically on the liquids used in grinding and mixing than zinc oxide. It can be used safely with driers containing lead and tinted with such colors as chrome yellow and chrome green without giving rise to any complications.

In opacity lithophone is equal or slightly superior to zinc, which means that it is decidedly superior to white lead, when equal weights are compared. In other words, if the same weight of pigment is spread over the same area the zinc oxide will obscure the surface better than the white lead. In actual practice this, of course, does not take place, as white lead is so much heavier that it naturally results in a much greater weight of pigment being spread over the same area.

In conjunction with these favorable characteristics of lithophone it has certain properties which are not so much in its favor. In direct sunlight, particularly on the exterior, lithophone is liable to discolor and turn a decided gray. There is a difference in brands in this respect, some turning very quickly and others being almost fast, excepting under the most humid weather conditions when the sun's rays are most intense. In addition lithophone has not shown itself to be a pigment of any great durability for exterior use, a straight lithophone paint disintegrating much more quickly than does a white lead paint. It is used to a certain extent in cheap grades of paint to modify the hardness of zinc oxide, but on the whole it should be considered, at the present stage of its manufacture at least, as essentially a pigment for interior use. In connection with its other properties it is safe to assume that lithophone will only average in its cost about 60 per cent the cost of white lead or zinc oxide.

In Enamels

In enamels, as in paints, the interest is largely in light tints, which require the use of a large percentage of white pigment. Zinc oxide has peculiar properties which make it admirably fitted for use here. Where extreme whiteness is required we have or, rather, did have, the perfect, white French process zinc and for the tinted enamels the high-grade American process zinc, both of which have a peculiar smoothness which results in producing a perfect enamel surface. Lithophone can be used to a certain extent in conjunction with zinc oxide, but it does not have the perfect smoothness which is desired in certain types of enamel finish, and in consequence it is not used in the very high-grade products.

The liquids of enamels may vary all the way from cheap rosin varnish to a long oil hard gum finishing varnish, and in the case of some of the highest-grade enamels the liquid contains no gum at all, but is composed entirely of oil, the resultant product having the gloss and flow of an enamel while retaining the elasticity of oil paint. When interior walls or woodwork are finished with enamels containing hard drying varnish it is only a question of time before this will crack and check and require scraping or sandpapering to put into proper condition for repainting. Even the best grades of varnish will lose their elasticity sooner than an oil paint, and while the all-oil enamels will not do so, they are more difficult to apply and less economical than properly made paint or semi-enamel. The result is that the use of enamel should be confined to that class of work where a very fine finish is desired and where in refinishing the work of rubbing down and sanding will be justified.

*Abstracted from a paper presented before the convention of the Maintenance of Way Master Painters' Association, October 16, 1917.

PROGRESS OF THE TOBACCO FUND

CONTRIBUTIONS TO THE TOBACCO FUND for the railway regiments in France continue to come in and this patriotic project initiated by several railway supply firms is now on a substantial basis. The first shipment of tobacco purchased with this fund was made on December 1 and consisted of nine cases, one for each of the railway regiments in France. The contents of each case included 12 20-lb. packages of tobacco, each package containing 15 lb. of Bull Durham in 1-oz. bags with cigarette papers and 5 lb. of Tuxedo smoking tobacco in 1-oz. packages. The shipment was handled through the Quartermaster's Department of the United States Army. Contributions received up to December 20

which were not recorded in last month's issue appear below:

Adams & Westlake Company, Chicago	$ 10	a month
American Arch Co., New York (to cover 15 months)	150	
American Vulcanized Fibre Company, Boston, Mass.	10	a month
Anchor Packing Company, Philadelphia, Pa.	10	"
Brown, J. Alexander, New York	10	"
Burden Sales Company, New York (to cover 6 months)	60	
Butler Drawbar Attachment Company, Cleveland, Ohio (contribution)	50	
Chambers Valve Co., New York	5	a month
Chicago Malleable Castings Company, Chicago	10	"
Chicago Railway Equipment Company, Chicago (contribution)	100	
Chicago Railway Signal & Supply Company, Chicago (to cover 3 months)	30	
Dayton Malleable Iron Co., Dayton, Ohio	10	a month
Edison Storage Battery Company	10	"
Elliott Frog & Switch Co., East St. Louis, Ill.	10	"
Fairbanks, Morse & Co., Chicago	10	"
Homestead Valve Manufacturing Company, Pittsburgh, Pa.	10	"
Joliet Railway Supply Co., Chicago	10	"
Kerite Insulated Wire & Cable Co., New York	10	"
Keystone Grinder & Mfg. Co., Pittsburgh, Pa.	10	"
Laas & Sponeburg Co., Chicago	10	"
Laconia Car Co., Laconia, N. H.	10	"
Marion Malleable Iron Works, Marion, Ind.	10	"
Massey Co., C. F., Chicago	10	"
Miner, W. H., Chicago	10	"
Mount Vernon Car Manufacturing Company, Mt. Vernon, Ill.	10	"
National Malleable Castings Company, Cleveland, Ohio	10	"
Ottenheimer & Co., Chicago	10	"
Ramapo Iron Works, Hillburn, N. Y.	10	"
Republic Rubber Co., New York	10	"
Rodger Ballast Car Company, Chicago	10	"
Signal Appliance Association (contribution)	17	
Steel Car Forge Co., Pittsburgh, Pa.	10	a month
Symington Company, T. H., Chicago	10	"
Union Draft Gear Co., Chicago (to cover 6 months)	60	
Union Switch & Signal Company, Swissvale, Pa.	10	a month
Watson-Stillman Company, Aldene, N. J.	10	"
Westinghouse Air Brake Co., Pittsburgh, Pa.	10	"
Westinghouse, H. H., New York	10	"

THE WOOD PRESERVERS' CONVENTION

AT A MEETING of the Executive Committee of the American Wood Preservers' Association in Chicago on December 17, it was decided to proceed with the original plans for the fourteenth annual meeting of that Association, which will be held at Chicago on January 22 to 24, inclusive. The advisability of postponing this convention or of omitting it entirely this year was given careful consideration, but it was decided that the importance of the conservation of timber and the unusual character of the new problems presented to this industry by the war made the exchange of information more than usually desirable. It was decided to limit entertainment to an informal dinner on Wednesday evening, which would be patriotic in character.

The tentative program so far as has been arranged is as follows:

TUESDAY MORNING

Convention called to order at 10 a. m.
President's address.
Report of committees.
Report of secretary-treasurer.
Communications.

TUESDAY AFTERNOON

Report of Conference Committee.
Report of Committee on Publicity, Promotion and Education.
Report of Committee on the Purchase and Preservation of Treatable Timber.

WEDNESDAY MORNING

Report of Committee on Service Tests.
(a) Ties and Structural Timber.
(b) Flooring and Paving.
Report of Committee on Plan Operation.
Report of Committee on Preservatives.

WEDNESDAY AFTERNOON

Report of Committee on Wood-Block Flooring and Paving.
Report of Committee on Non-Pressure Treatments.
Motion Picture Exhibit of the Manufacturing of Iron Pipe.

WEDNESDAY EVENING

Annual Dinner.

THURSDAY MORNING

Report of Committee on Terminology.
Report of Committee on Publications.
Closing Business.
Election of Officers.

In addition to the reports of committees arrangements are being made for a number of prominent men in the field of timber preservation to present individual papers upon important problems in this industry which are now of special interest.

"LEAKS"

F. T. BECKETT, engineer maintenance of way of the Chicago, Rock Island & Pacific at El Reno, has recently issued a small blue print entitled "Leaks." Copies of this blue print have been placed in each pumphouse, powerhouse and roundhouse and at practically every point where it can be seen by employees on the district. The print was issued with the idea of calling the attention of everyone to the importance of stopping water and steam leaks. The results have been very gratifying as the waste has been reduced to a minimum and it has been very noticeable that heretofore where valves have been left open because of carelessness or thoughtfulness on the part of employees they are now kept closed. The blue print which is shown on a basis of 40 lb. pressure indicates the number of gallons of water wasted per month, the cost of the coal wasted, and the total waste. It shows a condition which, if corrected on the entire line, would save a great deal for the company every month.

A. R. E. A. NOMINATIONS

THE NOMINATING COMMITTEE of the American Railway Engineering Association has nominated the following candidates for officers in that Association for the ensuing year:

President: C. A. Morse, chief engineer, Chicago, Rock Island & Pacific, Chicago.

Vice-President: H. R. Safford, chief engineer, Grand Trunk, Montreal, Canada.

Treasurer: Geo. H. Bremner, district engineer, Division of Valuation, Interstate Commerce Commission, Chicago.

Secretary: E. H. Fritch, Chicago.

Directors (three to be elected): J. L. Campbell, engineer maintenance of way, El Paso & Southwestern, El Paso, Texas; J. E. Crawford, chief engineer, Norfolk & Western, Roanoke, Va.; J. M. R. Fairbairn, assistant chief engineer, Eastern Lines, Canadian Pacific, Montreal, Canada; E. A. Frink, principal assistant engineer, Seaboard Air Line, Norfolk, Va.; John V. Hanna, chief engineer, Kansas City Terminal, Kansas City, Mo.; E. H. Lee, vice-president and chief engineer, Chicago & Western Indiana, Chicago, Ill.; H. T. Porter, chief engineer, Bessemer & Lake Erie, Greenville, Pa.; E. B. Temple, assistant chief engineer, Pennsylvania Railroad, Philadelphia, Pa.; F. E. Turneaure, dean, College of Engineering, University of Wisconsin, Madison, Wis.

Members of Nominating Committee (five to be elected): J. E. Crawford, chief engineer, Norfolk &

Western, Roanoke, Va.; Arthur Crumpton, assistant valuation engineer, Grand Trunk, Montreal, Can.; B. J. Dalton, chairman valuation committee, Missouri, Kansas & Texas, Parsons, Kan.; H. T. Douglas, Jr., chief engineer, Chicago & Alton, Chicago; John V. Hanna, chief engineer, Kansas City Terminal, Kansas City, Mo.; A. J. Himes, valuation engineer, New York, Chicago & St. Louis, Cleveland, Ohio; J. B. Jenkins, valuation engineer, Baltimore & Ohio, Baltimore, Md.; J. A. Peabody, signal engineer, Chicago & North Western, Chicago; A. R. Raymer, assistant chief engineer, Pittsburgh & Lake Erie, Pittsburgh, Pa.; J. E. Willoughby, chief engineer, Atlantic Coast Line, Wilmington, N. C.

THE MATERIAL MARKET

IF THE NUMBER of orders for railway materials recorded are to be taken as an index, the railways are far behind in their requirements for track materials. For the last three or four months very few orders of any kind have been brought to notice. The rail market has been at a standstill for the better part of the year and while new prices for rails have been hinted at nothing tangible has been done. Within the last month the New York Central made a reservation of rolling schedule for 150,000 tons of rails for 1919 delivery, but no formal contract has been announced. Several roads have followed this same procedure for next year's requirements.

Taken altogether, the market is gradually becoming quieter with the increased application of the priority orders and the establishment of the fixed prices. Some uneasiness has resulted from speculation as to the possible revision of these fixed prices about the first of the year, but this is not generally taken seriously. A fixed price for cast iron pipe is anticipated. A beginning in what may be expected on a larger scale as the war goes on, was made recently in the sale of the New York & Pennsylvania Railway to the Benjamin Iron & Steel Company of Buffalo. This is a 57-mile abandoned railway between Canisteo, N. Y., and Shinglehouse, Pa. The rails are to be taken up and sent abroad.

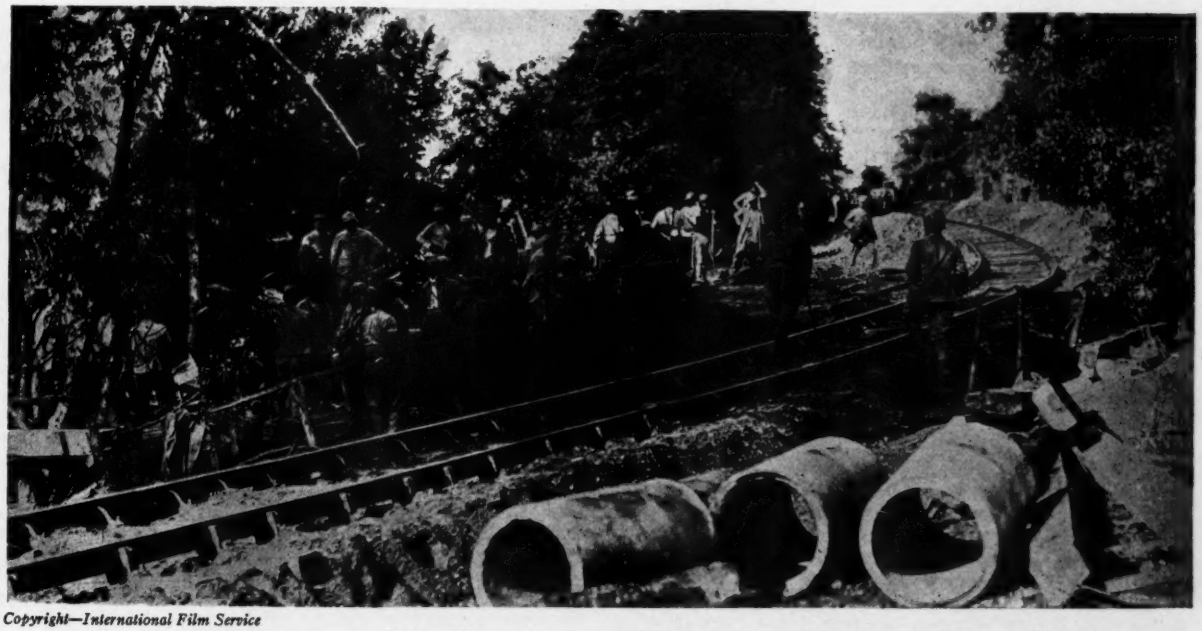
Scrap has been the most active material on the market, because the supply is apparently unequal to the demand, a condition accounted for by a number of factors, such as the decrease in the production of pig iron, the closing of the ore traffic on the Great Lakes and the railway congestion in the east. These conditions have resulted in further advances in the prices of old material. Rerolling rails are now selling at from $35 to $40 per gross ton. Frog and switch scrap is quoted at $28 to $29 per net ton and scrap angle bars and splice bars at about $37 per net ton.

Four contracts for structural steel awarded by railways during the month indicate the limited character of purchases of this class by the carriers at the present time. The New York Central ordered 450 tons, the Chesapeake & Ohio 250 tons and the Rock Island 110 tons, all for bridge work. The Great Northern also ordered 1,138 tons for the repair of a steel ore dock. The established prices for plain material are 3 cents per pound for structural shapes, 3.25 cents for plates and 2.9 cents for bars.

The nominal pound prices for track fastenings are 3.25 cents to 4 cents for angle bars, 4.5 cents to 5.25 cents for track spikes, 5.25 cents to 7 cents for track bolts. The price of tie plates is $75 per ton. In wire products the current prices per 100 lb. are $3.50 for wire nails, $3.25 for plain wire, $3.95 for galvanized wire and $4.35 for galvanized barb wire.

No change has taken place in the price of concrete materials. The market is dull. The current prices for cement per barrel not including package are $1.81 for Chicago, $1.91 for Pittsburgh, $2.00 for Detroit and Toledo, $1.92 for Milwaukee and Peoria, $2.08 for St. Paul and Minneapolis.

In the lumber market, yellow pine and cypress have underdone minor advances in price. The white pine market has closed sooner than usual on account of a early winter season. Difficulties in making deliveries are being experienced on a wider scale on account of the greater influence of the freight congestion than for some months in the past.



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RAILWAY RECONSTRUCTION KEEPS PACE WITH THE MOVING ARMY BEHIND THE FRENCH LINES

GENERAL NEWS DEPARTMENT

The Southern Pacific has issued orders that on its lines in Texas, New Mexico and Arizona, all cattle and other edible animals killed on the track shall be saved and the meat disposed of to butchers. The pelts of these animals must also be saved and sold.

The Quebec bridge across the St. Lawrence river was formally opened to traffic with appropriate ceremonies on December 3. This great structure affords a new through all-rail route from central Canada to the port of Halifax and is now carrying its portion of the war traffic to the seaboard.

The annual report of the postmaster general shows that the length of lines on which railway postoffice service was in operation on June 30, 1917, equaled 231,501.49 miles, with annual miles of service of 308,018,777. The length of line on which closed-pouch service was in operation was 71,268.32 miles and the annual miles of service was 281,499,859.

The Texas & Pacific instructed each section foreman at the beginning of the crop season last year to plant and cultivate not less than three-quarters of an acre of ground upon the right-of-way. The men were allowed time to work these gardens, with the result that they planted and harvested bountiful crops on about 400 acres of the company's land.

The Railroads' War Board, through Fairfax Harrison, its chairman, has addressed a bulletin to the railroads expressing its opinion that the use of official and private passenger cars should be limited in order to relieve overburdened passenger trains. It is suggested that "no such cars be handled, either in free or pay service, except for the accommodation of railroad officers when traveling on necessary railroad business."

The Paducah & Illinois Railroad bridge over the Ohio river at Metropolis, Ill., was opened to traffic late in December. This bridge is notable as having the longest simple span (720 ft.) in the world. The Paducah & Illinois Railroad is owned jointly by the Chicago, Burlington & Quincy and the Nashville, Chattanooga & St. Louis, and its completion opens up a new all-rail route for traffic from the northwest to the southeast.

American railway men, members of one of the railway regiments, took part in the battle of Cambrai early in December. The men, who were probably members of the Eleventh railway regiment recruited in New York, had been engaged in the construction of roads behind the English lines for about four months. Dropping their construction tools when the Germans attacked, these men took part in the battle, and a number were injured and taken prisoners. Among the list of casualties in this force were included the names of 12 men severely wounded and two slightly wounded.

The Interstate Commerce Commission in its annual report for the year ending October 31, 1917, states that the roadway and track parties of the Bureau of Valuation inventoried 52,946.65 miles of main line during the year and that by January 1, 1918, more than 150,000 miles of main lines will have been covered by these parties. While war conditions have interfered with the progress of this work, the Commission still believes that the engineering forces should substantially complete their field work during 1919 and should clean up the balance of their field work and their office work during 1920.

The Southern Pacific is launching a vigorous campaign of fire protection throughout its system, and the 45,000 employees are being asked to spread the gospel among shippers, warehousemen and others. General Manager W. R. Scott says, in a circular: "The responsibility of feeding not only ourselves, but our allies, rests largely upon this nation. As all the materials, supplies and foodstuffs necessary for our domestic use, the use of our armies and our navy must be transported over our railways, the necessity for fire protection becomes a patriotic duty. No amount of insurance can replace food and materials that are destroyed."

The Iowa Supreme Court, in a recent case in which a section hand who, while placing a hand car on the rails, had his limbs pricked with burs and thistles, causing blood poisoning, and who sued the railroad company on the ground that it failed to furnish a reasonably safe place to work, held that the presence of these weeds on the right-of-way is not a breach of the railroad's duty to furnish a safe place for section hands to work whose duties involved the care and maintenance of this right-of-way. This decision was made, although an Iowa statute requires the railroads to destroy such weeds or pay the expense of their destruction by the public authorities.

The Department of Commerce has issued a statement to the effect that through the negligence of live-stock owners food animals numbering 1,862, including fine dairy cows and beef cattle as well as hogs and sheep, valued at $20,000, were killed on the tracks of the Central of Georgia during the first nine months of this year. This is equal to one animal for every mile of track; and if that figure can be accepted as a basis for estimating the loss for the entire country, the destruction of food animals on the railway tracks of the United States during the first nine months of this year can be put at $2,760,000, or $3,680,000 for the whole year. The lesson is obvious.

Japanese troops, according to information received at Washington, have occupied the great railroad works at Vladivostok, the Pacific terminal of the Trans-Siberian Railway. These railroad works have been the place where all the imported railroad cars and locomotives shipped from the United States and purchased under the Russian credit in this country have been assembled. There are also at Vladivostok great supplies of other kinds of stores, including ammunition. The possession of the railway yards and the railway equipment at the Vladivostok terminals will make it absolutely impossible for the Bolshevist government to move these cars and stores without the consent of the Entente powers.

Recent Decisions Under the Federal Employers' Liability Act

The Circuit Court of Appeals, Sixth District, holds that an employee engaged in repairing a bridge used by an interstate carrier on its main line is engaged in interstate commerce.

The North Dakota Federal District Court holds that an employee of an interstate railway company engaged in operating a pumping station furnishing water indiscriminately and contemporaneously to locomotives engaged in interstate and intrastate commerce is within the act.

The Illinois Supreme Court holds that a carpenter employed by an interstate and intrastate railroad in building forms on the margins of a right-of-way into which concrete was to be poured to form retaining walls for concrete for the elevation of the tracks, and who was injured by sawdust flying into his eye, was not engaged in interstate commerce.

The North Carolina Supreme Court holds that an employee who, on the specific orders of the foreman, was carrying cross-ties to a repair track used by a railroad engaged in interstate commerce, and which track was to be used by a waiting train immediately on being repaired, was engaged in interstate commerce.

The Michigan Supreme Court holds that a servant employed to provide coal and water for locomotives and to aid in moving them about the yards while on their way from Ohio to Michigan or from Michigan to Ohio, was employed in interstate commerce, though sometimes the engines came in from one state at night and did not go out until the next morning.

PERSONAL MENTION

GENERAL

E. L. Hill, an assistant in the engineering department of the Erie at New York, has been appointed assistant to the general manager with headquarters at New York.

J. S. Miller, roadmaster and assistant trainmaster on the Aurora division of the Chicago, Burlington & Quincy, with headquarters at Aurora, Ill., has been promoted to trainmaster at Galesburg.

W. G. Dungan, trainmaster and roadmaster on the Chicago, Burlington & Quincy at Orleans, Neb., has been appointed assistant superintendent of the Alliance division with headquarters at Deadwood, S. D., succeeding C. C. Holtorf.

R. E. Woodruff, who has been appointed superintendent of transportation of the Erie, with headquarters at Youngstown, Ohio, is an engineer by training. He was born at Green Bay, Wis. He graduated from Purdue university in 1905 and in the same year began his railroad career with the Erie as a track laborer. He later served as foreman, transitman, assistant division engineer, division engineer and trainmaster at various points on the lines west. In November, 1910, he was advanced to division superintendent at Rochester, N. Y. He was superintendent of the Mahoning division, with headquarters at Youngstown, Ohio, at the time of his recent appointment.

Charles H. Ewing, who has been appointed vice-president and general manager of the Philadelphia & Reading, with headquarters at Philadelphia, Pa., received his training in the engineering department. He was born in May, 1866, and in August, 1883, entered the service of the Philadelphia & Reading as a rodman. In March, 1887, he became assistant engineer, in charge of construction and maintenance, and remained in this position until December, 1891, when he was made supervisor. In November, 1892, he was appointed chief engineer of the Central New England, with headquarters at Hartford, Conn., where he remained for a year, returning then to the Philadelphia & Reading in the same capacity. He was appointed engineer maintenance of way in June, 1905, which position he held until October, 1910, when he was appointed superintendent of the Atlantic City Railroad. On January 1, 1913, he was appointed general superintendent and in March, 1916, was made general manager, which position he held at the time of his appointment to vice-president on December 1.

CHARLES H. EWING

John Sesser, who was recently appointed assistant general superintendent of the Great Northern, with headquarters at Great Falls, Mont., was born at St. Joseph, Mich., on August 20, 1873, and graduated from the civil engineering course at Lehigh University in 1896. From 1897 to 1898 he was instrument man and resident engineer on the Chicago & North Western, on double-track work in Illinois, and resident engineer on the Union Pacific, in charge of heavy construction work in Wyoming; from 1901 to 1902 he was resident engineer on the Chicago, Milwaukee & St. Paul, and from 1902 to 1907 he was with the Chicago, Burlington & Quincy. In December, 1909, he entered the service of the Great Northern as trainmaster, and in April, 1910, was promoted to assistant engineer maintenance of way of the system. In July, 1913, he was promoted to superintendent, with headquarters at Whitefish, Mont., which position he held until his appointment as assistant general superintendent.

J. B. Hutchinson, Jr., who has been appointed superintendent of the Tyrone division of the Pennsylvania Railroad, with headquarters at Tyrone, Pa., received most of his training in the maintenance of way department. He was born on March 3, 1876, at Bristol, Pa., and was educated in Princeton University. While attending college he worked for the Pennsylvania Railroad during his summer vacations, and on January 1, 1898,, was appointed rodman. In April, 1899, he was transferred to the office of the principal assistant engineer at Altoona, Pa., the following November he was made assistant supervisor on the West Penn division, and in 1900 he was transferred to the Pittsburgh division. He was promoted to supervisor on the West Penn division in 1901, and in 1905 was transferred to the Middle division in the same capacity. In January, 1910, he was appointed division engineer of the West Jersey & Seashore Railroad and three years later was transferred to the Williamsport and Susquehanna divisions of the Pennsylvania. He was appointed division engineer of the Monongahela division on February 11, 1914, and in September, 1916, was transferred to the Pittsburgh division in the same capacity. In April, 1917, he was promoted to assistant superintendent of the Pittsburgh division and on October 25 was made superintendent of the Tyrone division, as above noted.

J. B. HUTCHINSON, JR.

Frederick McQ. Falck, assistant general manager of the Philadelphia & Reading, who was appointed general manager, with headquarters at Philadelphia, Pa., on December 1, began railway work as an assistant supervisor with that road at Shamokin, Pa., in 1898. He was born at Atlanta, Ga., July 5, 1874, and graduated from Cornell University in 1894. He remained at Shamokin until May, 1900, when he was promoted to supervisor. In December, 1901, he was made supervisor of the New York division, and in May, 1903, became division engineer of the Shamokin division. He became assistant superintendent of the Wilmington and Columbia division in March, 1910, and in October of the same year was made superintendent of that division. On January 1, 1913, he was transferred in the same capacity to the Atlantic City Railroad, with office at Camden, N. J., where he remained until October, 1916, when he was appointed acting superintendent of the Reading division. He returned to the Atlantic City Railroad as superintendent in January, 1917, and also was superintendent of the Delaware River Ferry Company, where he remained until April of the same year, when he was appointed assistant general manager.

FREDERICK MCQ. FALCK

W. H. Kirkbride, division engineer of the Sacramento division of the Southern Pacific, with headquarters at Sacramento, Cal., has been appointed assistant superintendent of the same division, with the same headquarters, succeeding J. T. Bell, who has been transferred to the Salt Lake division. Mr. Kirkbride graduated from the Leland Stanford, Junior, University in 1895, and for seven years was engaged in mining engineering, railroad location and construction work. In August, 1902, he entered the employ of the Southern Pacific as assistant engineer at Sacramento, where he remained until April, 1904, when he was appointed roadmaster of the Red Bluff district. In February, 1906, he was made assistant division engineer of the Sacramento division, and in April, 1909, was promoted to division engineer of the Coast division, with headquarters at San Francisco. He was then appointed division engineer of the Sacramento division in March, 1911, where he remained until his promotion as noted above.

W. H. KIRKBRIDE

ENGINEERING

W. E. Burkhalter has been appointed acting division engineer of the St. Louis division of the Mobile & Ohio, with headquarters at Murphysboro, Ill.

A. A. Culp has been appointed resident engineer on the Southern Railway, with headquarters at Selma, N. C., succeeding **C. A. Redinger,** who has been granted a leave of absence.

C. U. Irvine has been appointed division engineer of the Southern Railway in Mississippi, with headquarters at Columbus, Miss., succeeding W. F. McDade, who has resigned, effective December 13.

S. H. Osborne, assistant engineer on special assignment in the maintenance of way department of the Union Pacific, with headquarters at Omaha, Neb., has been appointed division engineer of the Kansas division, with headquarters at Kansas City, Mo., succeeding G. F. Maitland, who has resigned, effective December 1. Mr. Osborne has served in both the maintenance of way and construction departments, first being a construction clerk, and in turn, axeman, rodman, instrument man and assistant engineer, in charge of party on new line construction. He was also division engineer on the Oregon Short Line, with headquarters at Pocatello, Idaho, leaving there in December, 1914, to engage in farming, which he later gave up to return to railroad service as assistant engineer, as above noted.

H. J. Graeser, office engineer of the St. Louis Southwestern, has been appointed division engineer, with headquarters at Mt. Pleasant, Tex., succeeding T. J. Williams, resigned. Mr. Graeser was born in St. Louis, Mo., in March, 1876, and attended the Missouri School of Mines. He entered railway service as a levelman with the Missouri Pacific in August, 1901, and in December of the same year became draftsman for the Ft. Smith & Western. From September, 1904, until February, 1906, he had a varied experience in the field and office for the St. Louis-San Francisco, the Missouri Pacific and the St. Louis World's Fair Co., and on location work for private capital in Illinois, coming to the St. Louis Southwestern in the latter year as office engineer.

TRACK

M. W. Self, supervisor of bridges and buildings for the Southern Railway, lines west, with office at Birmingham, Ala., has been appointed roadmaster of the Birmingham division, with headquarters at Birmingham, succeeding **A. P. New,** promoted.

E. E. Turner has been appointed roadmaster on the Missouri, Kansas & Texas, with headquarters at Denison, Tex., with jurisdiction from Denison to Dallas, succeeding **R. J. Larmer,** who has been transferred to the territory between Hillsboro and Dallas. Mr. Larmer succeeds **D. M. Neer,** who has been assigned to construction work.

John Reinehr, who for many years has been superintendent of the rail mill of the Chicago, Milwaukee & St. Paul, at Savanna, Ill., has been made superintendent of the frog, switch and lamp shops of the same road, located at Tomah, Wis., effective December 1. He succeeds **Ira G. Stutsman,** who has resigned to accept a position with the Four Lakes Ordnance Co., of Madison, Wis.

J. V. Donielson has been appointed roadmaster on the Sheridan division of the Chicago, Burlington & Quincy, Lines West of the Missouri river, in charge of the territory from Dietz, Wyo., to Billings, Mont., with headquarters at Sheridan, Wyo., succeeding **Adam Helzer,** who has been transferred to Gillette, Wyo., in charge of the territory from Gillette to Edgemont, in place of **L. D. Benham.**

J. H. Cooper, assistant supervisor on the Pennsylvania Railroad at Tacony, Pa., has been promoted to supervisor at Phillipsburg, N. J., succeeding **Wm. DeK. Smith.** Mr. Cooper was educated at Lafayette College, graduating in 1905. He entered the service of the Pennsylvania Railroad the same year as a rodman at Sunbury, Pa., and subsequently served at rodman and transitman at Sunbury, Williamsport and Philadelphia. In 1910 he was promoted to assistant supervisor at Tyrone and subsequently served in that capacity at Blairsville, Pooli and Tacony.

P. H. Hamilton, formerly safety inspector for the St. Louis-San Francisco, with headquarters at Springfield, Mo., has been appointed roadmaster of the Cherokee subdivision, with headquarters at Sapulpa, Okla., succeeding **P. Nelson,** who has been assigned to other duties. Mr. Hamilton entered service with the Frisco in 1909 as a roadmaster's clerk and served in various capacities on six different divisions until January 1, 1917, when he was appointed safety inspector. He will now have charge of the line extending from Monett, Mo., to Sapulpa, Okla.

W. O. Frame, roadmaster on the Hannibal division of the Chicago, Burlington & Quincy, with headquarters at Old Monroe, Mo., has been promoted to roadmaster and assistant trainmaster on the Aurora division, with headquarters at Aurora, Ill., succeeding **J. S. Miller,** promoted to trainmaster at Galesburg. **H. R. Clark,** roadmaster on the north end of the Hannibal division, with headquarters at Hannibal, Mo., has been transferred to the south end of this division, with headquarters at Old Monroe, to succeed Mr. Frame. **T. E. Casteel,** roadmaster on the Centerville division, with headquarters at Centerville, Iowa, has been transferred to Hannibal, Mo., succeeding Mr. Clark.

W. H. Durbin, who was appointed roadmaster of the second district of the Illinois division of the Atchison, Topeka & Santa Fe, with headquarters at Chillicothe, Ill., as announced in last month's issue, entered service with the Santa Fe as a track laborer in May, 1898. In 1902 he was made timekeeper on an extra gang and in 1906 entered the engineering department as a masonry inspector, where a year later he was made foreman on concrete bridge work. He re-entered the track department in 1908, becoming assistant roadmaster, and in 1911 was made track inspector. A year later he was made trainmaster on construction and in 1913 was promoted to superintendent of track. After the completion of this work he was employed as foreman on construction with the Pacific Electric at Los Angeles and the Santa Fe at Winslow, Ariz. Early in 1917 he was appointed track inspector on construction in Texas, and in October of the same year was transferred to the Illinois division as roadmaster.

BRIDGE

Correy St. Claire of Toledo, Ohio, has been appointed general bridge foreman on the Pere Marquette, with headquarters at Detroit, succeeding **J. E. Toohey,** resigned.

Leland Clapper has been appointed engineer of bridges and buildings of the Duluth & Iron Range. His duties will include those previously performed by **B. T. McIver,** general foreman bridges and buildings, resigned, and such other duties as may be assigned him.

R. Hayes, resident engineer on the Southern Railway at Alexandria, Va., has been promoted to the position of structural engineer in the office of the assistant to the vice-president at Washington, D. C., succeeding **P. B. Lum,** who has resigned to engage in other business.

PURCHASING

R. L. Agner has been appointed division storekeeper of the Southern, with office at Alexandria, Va., succeeding **A. B. Lackey,** who has resigned to enter military service.

G. W. Thompson has been appointed assistant to the president and purchasing agent of the Detroit, Toledo & Ironton, with headquarters at Detroit, Mich., succeeding **A. H. Jones,** transferred, effective November 15.

F. W. Taylor, general purchasing agent of the Pacific Electric, with headquarters at Los Angeles, Cal., has been appointed general purchasing agent of the Southern Pacific, with headquarters at San Francisco, Cal., succeeding **I. O. Rhoades,** who has retired, effective December 1.

OBITUARY

Thomas A. Ayres, assistant purchasing agent of the Erie, with headquarters at New York, died on December 9, at his home in Ridgewood, N. J., at the age of 38.

G. M. Anderton, first lieutenant, engineer corps, formerly an assistant engineer on the Illinois Central, died December 9 on board a United States transport bound for Europe.

Reports to the Railroads' War Board show that on December 1 the excess of unfilled car orders amounted to 117,132 cars, a decrease of 22,880 compared with November 1, and an increase of only 10,000 cars compared with December 1 a year ago; although the railroads are handling currently at least 20 per cent more passenger and freight business than a year ago.

The imports of creosote oil in the United States during the fiscal years ending June 30, 1916 and 1917, as compiled by the Bureau of Foreign and Domestic Commerce, were as follows:

	1916		1917	
Source	Gallons	Value	Gallons	Value
England	34,616,238	$2,763,078	25,782,272	$1,920,446
Scotland	505,346	62,285	206,012	30,270
Canada	3,746,192	272,273	3,089,754	233,853
Japan	1,630,616	109,144	.....	.....
	40,498,392	$3,206,790	29,078,038	$2,184,569

From these figures there is shown a decrease of 11,420,354 gals., the larger part of which results from the heavy falling off in importations from England and the suppression of shipments from Japan. The average invoiced value of all creosote importations last year was 7.2 cents per gallon as compared with 7.9 cents in 1916.

The railroads suffered severely in the disastrous explosion of a shipload of munitions in the harbor of Halifax, N. S., on Thursday, December 6, in which 1,200 or more persons were killed and the city devastated over a territory of 2½ square miles. The central passenger station was wrecked, many lives being lost, practically all buildings in the freight yards were demolished and about 400 freight cars were destroyed, some by the fire which followed the explosion. One statement says that, for a distance of 2 miles, freight cars were lifted off the track and thrown into the ditches or the adjacent fields. At Richmond station every employee was killed besides those killed in the freight yards.

CONSTRUCTION NEWS

The Canadian Northern Pacific has commenced the construction of train sheds and a concourse for a new passenger terminal at Vancouver, B. C. The train shed will be 21 ft. in height, 90 ft. wide and 900 ft. long, of reinforced concrete construction on wooden piles, with platforms of wood. The concourse will be 21 ft. in height, 40 ft. wide and 310 ft. long, of reinforced concrete construction on wooden piles, with a floor of concrete. The work will cost about $170,000 and is being done by the Northern Construction Company, Limited, and Carter, Halls & Aldinger, Limited, joint contractors, both of Vancouver, B. C. The plans were prepared by Pratt & Ross, architects and engineers, Vancouver.

The Illinois Central has purchased property on the west side of its right-of-way at Fifty-third street (Hyde Park), Chicago, upon which it plans to construct a new passenger station.

The Kettle Valley plans to build a line from Princeton, B. C., south along the Similkameen river to Copper mountain, a distance of about 14 miles, to serve the copper mines of the Canada Copper Corporation. The work involves the handling of about 50,000 cu. yd. of grading per mile, of which 40 per cent will be solid rock, the building of a bridge over the Similkameen river, the construction of a number of trestles and the boring of four tunnels. Contracts for the grading and bridge work will be let soon.

The Lehigh Valley, the Pennsylvania and City of Newark, N. J., are jointly building a temporary steel and timber bridge over the Lehigh Valley and Pennsylvania tracks at Bay avenue, Newark, to eliminate a grade crossing. The Lehigh Valley carried out its part of the work with company forces and Henry Steers has the contract for the Pennsylvania's share of the work. The total cost, $75,000, is to be shared jointly by the railroads and the city of Newark.

The Missouri, Kansas & Texas of Texas has awarded a contract to the List & Gifford Construction Company, Kansas City, Mo., to eliminate three grade crossings and improve three under-grade crossings at Dallas, Tex., at a cost of about $350,000. The work involves the use of 55,000 lb. of steel, 5,400 cu. yd. of concrete, the excavation of 50,000 cu. yd. of earth and the construction of a fill of 135,000 cu. yd.

The Nashville, Chattanooga & St. Louis is building, with company forces, an extension from Coalmont, Tenn., to the new mines of the Tennessee Consolidated Coal Company at the head of Mill creek. About 80 per cent of the grading has been completed and six miles of track have been laid. The work includes handling about 28,000 cu. yd. of grading per mile, 80 per cent of which is rock. Two stations are being built on the line.

The New York, New Haven & Hartford has given a contract to the Thompson-Starrett Company, New York, for building a new station at New Haven. The work is to be carried out on a cost plus percentage basis.

The Pennsylvania Lines West has made plans and will ask bids soon for improvements to be carried out at Cincinnati, Ohio, on the Cincinnati, Lebanon & Northern. The work will include new inbound and outbound freight stations, office building, team track yards, etc., to cost $250,000.

The Pennsylvania Railroad has started construction work on the Chester & Philadelphia branch of the Philadelphia, Baltimore & Washington. This branch leaves the South Chester branch near Central and Delaware avenues, Chester, Pa., and is located over private property to Front street. From the latter point it will be constructed through the city of Chester to Ridley Creek, thence via North Washington to a connection with the Pennsylvania Railroad at Girard Point. The general contract has been given to the James McGraw Company.

SUPPLY TRADE NEWS

H. G. Dorman & Co., Chicago, has been appointed agent for the Rivet Cutting Gun Company, Cincinnati, Ohio.

Axil A. Strom, vice-president of the Pettibone-Mulliken, and president of the U. S. Ball Bearing Co., Chicago, died in New York on November 29.

L. B. Moses, who was sales manager of the Kettle River Company, Minneapolis, Minn., since 1911, has been elected second vice-president of the Walter A. Zelnicker Supply Company, and will have charge of the rail department of that company, with headquarters in St. Louis, Mo.

E. M. Baylies, eastern manager of the P. & M. Company at New York, has been appointed general sales agent, with offices at 30 Church street, New York, and Railway Exchange building, Chicago. He was born at Des Moines, Iowa, on March 14, 1878. After graduating from high school he was for two years with the Metropolitan West Side Elevated, Chicago, as a student apprentice, following which he was with the Rockford & Interurban as assistant to the general manager. He was later associated with the Aluminum Company of America as assistant sales agent at Chicago, and on December 1, 1914, was elected eastern manager of the P. & M. Company. He has been a stockholder and director of the P. & M. Company since its organization.

E. M. BAYLIES

The Glidden Company

The Glidden Company, Cleveland, Ohio, which is a new organization with a capital stock of $2,500,000, has purchased outright the Glidden Varnish Company of Cleveland, and its subsidiary, the Glidden Varnish Company, Ltd., of Toronto, Canada. This new corporation is headed by **Adrian D. Joyce,** who was until recently director and general manager of sales and distribution of the Sherwin-Williams Company, having been with this company nearly 20 years. He at first was a traveling salesman, later special representative for the industrial trade, then sales manager of the Kansas City district, and later assistant sales manager of the company in Cleveland, being next appointed manager of sales and distribution. He also was a director of the Sherwin-Williams Company. Mr. Joyce has had a broad sales and executive experience, having been in charge of all sales and warehouse direction. He has also been closely identified with national and international affairs in the paint and varnish trade and is experienced in manufacturing methods, having made a study of raw materials and the new uses of paint and varnish materials.

A. D. JOYCE

Associated with Mr. Joyce are **O. A. Hasse,** formerly manager of paint and varnish sales for the Sherwin-Williams Company, and **R. H. Horsburgh,** formerly controller of the same company. They will assume the positions of vice-president and secretary-treasurer, respectively, in the new corporation. All three men have resigned their connections with the Sherwin-Williams Company, and the new company is not connected in any way with other paint and varnish interests.

O. A. HASSE

O. A. Hasse's entire experience has been in the paint and varnish business, having started in the advertising department. He then served as secretary, was later transferred to the sales department and finally was made manager of paint and varnish sales. He has also had experience as a traveling salesman, being familiar with sales and manufacturing problems. At one time he had entire charge of the development of railway sales.

R. H. Horsburgh was with the Sherwin-Williams Company for 18 years, starting in as office boy and working up to controller, in which position he had charge of credits, accounts, taxes and insurance. He was in close touch with the financing of the company, was a credit specialist and has spent his entire career in this industry.

R. H. HORSBURGH.

Members of the Glidden family, including F. A. Glidden, formerly president of the Glidden Varnish Company, will retire from the new corporation, but the balance of the organization will remain intact and will be enlarged as necessity demands.

The present Glidden plant covers nearly 17 acres of land. With present extension plans completed, the company will be the largest varnish manufacturers in the country.

L. F. Hamilton, manager of the advertising and specialty department of the National Tube Company, Pittsburgh, Pa., has become associated with the Walworth Manufacturing Company, Boston, Mass., and will be succeeded by his assistant, **W. L. Schaeffer.** The Walworth Manufacturing Company recently purchased the Kewanee works and the Kewanee line of products from the National Tube Company. Mr. Hamilton's new duties are similar to those with the old concern, his work dealing particularly with the training of specialty students, the supervision of sales promotion work, etc.

TRADE PUBLICATIONS

Long Leaf Pine Timber.—The Crowell & Spencer Lumber Company, Long Leaf, La., has issued a 24-page booklet describing Calcasieu long leaf pine and the merit of the trademark containing the word "Calcasieu" on structural timbers. The book also contains suggested specifications for yellow pine timbers and tables of properties of yellow pine beams and columns, together with a table of unit stresses for timbers used in wooden bridges and trestles.